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Poliomyelitis: Control and Treatment*

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NOW, after more than a hundred years of study of infantile paralysis, real progress is being made in mastery as to its cause, means of spread, control, and treatment. While it must be admitted that today there are no preventive measures, either personal or public, and there is no treatment of the disease process itself, yet trails have been blazed. The physicians and scientists no longer are groping in the dark. Clues have been furnished, some or all of which may lead to practical control and treatment measures.

The Virus

Great credit must be given to those pioneers—Landsteiner and Popper (1), Flexner and Lewis (2), and Römer (3), who with their crude methods and limited supplies first demonstrated that the disease was due to a virus. These men worked almost totally in the dark with a substance the nature of which was not at all understood. It is difficult to make progress when all factors of a problem are unknown.

The nature of the virus is not yet completely understood, but some things are known. First, it does appear to be a form of living substance, with a particle size of 10 millimicrons—about twenty times smaller than can be seen with any ordinary microscope. From the cords of infected monkeys Loring (4) has obtained purifications of virus which can produce infection in dilutions of one to two hundred million. Chemically he has shown the virus to be protein, or protein in combination with nucleic acid.

This particular virus has not been grown on any artificial media or any

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living tissue save that of man and a limited few of the anthropoids. Sabin and Olitsky (5) in 1936 did report apparent reproduction of virus in a medium containing fresh or living embryonic human nervous tissue obtained by cesarean section. The M.V. strain with which they worked did not grow on similar tissue of other species. One, and only one strain has been successfully adapted for growth in animals other than the human or monkeys. Armstrong (6, 7) in 1939 succeeded in having the Lansing strain grow in the cotton rat (*Sigmodon hispidus hispidus*) and later in the white mouse. While Toomey (8) has reported adaptation of other strains to growth in these same animals, his work has not been confirmed, nor has that of Jungeblut and Sanders (9) who have reported adaptation of the S.K. strain to cotton rats, white mice, and guinea pigs.

The apparent success of some and the apparent failures of other competent workers to obtain growth of the poliomyelitis virus in the smaller laboratory animals has no explanation. There is a possibility that variations and mutations occur in this virus when kept under varying conditions. There undoubtedly must be a variability of the invading organism as well as the host factor.

Today, with the ready availability of monkeys, with the development of the ultracentrifuge and the electron microscope, and with the improved technics of purifying the poliomyelitis virus, research dealing with the nature of the organism is going ahead very rapidly. There is much to be done. The tools with which to work have been developed. There is need of a quick and inexpensive method of growing and identifying this virus. The time interval must be reduced from weeks and months to a matter of days. The cost must be reduced to cents, or at most a few dollars, rather than the approximately $50 to $100 now needed for the study of a single unknown specimen. There is need for a rapid presumptive, diagnostic test, a precipitation, an agglutination, or a complement fixation test. Today this is lacking. There are only the clinical signs to serve for diagnosis of the case.

EPIDEMIOLOGY

Poliomyelitis was not seriously considered as an epidemic disease until about 1880. Paul (10) attributes this to a change in character of the disease from that of a sporadic to an epidemic occurrence. He states that "from a curiosity the disease became a periodic scourge". Other workers are prone to place more emphasis on the increased interest in and the development of epidemiology as a science, rather than any significant change in the nature of the clinical manifestations.

Poliomyelitis workers from Heine (11), Caverly (12), Kling (13), Wickman (14) on to those of the immediate past described many phases of the disease and offered many theoretical explanations of the epidemiological phenomena, but they were not prepared to offer definite proof of any of their major contentions. It was one thing for Kling, Pettersson, and Wernstedt (15) in 1912 to show the presence of the virus in the stool of a case, but it took

thousands of monkeys and years of work to arrive at the stage of study now possible.

It has been only during the past few years that Paul and Trask (16, 17) have demonstrated the virus in stools, sewage, and flies; that the virus has been suspected not only in flies but fish; that Meyer and Hammon, Toomey, Kessel, Sabin, Piszczek, Kramer, McClure, Craigie, and others have conducted their detailed clinical epidemiological studies. These men have been able to go into the field, to study the cases, collect their specimens, inoculate animals, and thus draw an almost completed picture of events which have taken place, allowing for outbreaks and isolated cases.

This work is far from finished, but much is known. It was not until an agency such as the National Foundation for Infantile Paralysis was established, created for one purpose, that either money, animals, or equipment was available in great enough quantity for this work.

Many cases and carriers, for months following their exposure, excrete vast amounts of virus from the intestinal tract. This material may be distributed over great distances. Most likely it finds its way not only into water, milk, foods, and insects, but into the air itself.

The virus is highly resistant to many agents capable of killing ordinary bacterial forms of life. It can be dried and still not lose its infectivity; it readily resists chlorine action (18); extremely low temperatures act only as a preservative; it can be stored in glycerol for many years.

Where contact has been intimate or repeated a very high percentage of persons become carriers of the disease organism. These carriers may present few or absolutely no symptoms of infection. All ages appear to serve as carriers with the highest percentage found in the younger age groups. Contacts to carriers may in turn become carriers. Combine these factors: (1) many symptomless carriers; (2) elimination through the intestine; and (3) an organism exceedingly tenacious of life—and it seems remarkable that there are not more cases and greater epidemics.

Add to this still another picture—one which is just beginning to unfold—and the potential danger appears still greater. Sabin (19) has reported recovery of the virus from the blood of a cynomolgus monkey. Hammon, in a report recently submitted for publication, reported observing neutralizing antibodies in 45 per cent of a fair-sized series of domestic animals tested. The biting insects, therefore, may play their part in the dissemination of the organism.

The epidemiological problem is not simplified by the fact that apparently there are many possible channels or portals of entry. Sabin (19), Trask (20), and others have reported repeated successful attempts to produce infection by feeding virus-laden material to susceptible animals—*Macacus cynomolgus* and *Cercopithecus aethiops sabaeus* (Green African monkey). Faber (21) has infected animals by inhalation, after the olfactory path had been well blocked. Howe, Clark, and others have produced infection by nerve inoculation, or by immersing the end of severed peripheral nerves in virus sus-

pension. The olfactory nerve, peritoneum, subcutaneous tissues, have all allowed for active infection in the properly selected animal.

It would seem that any method by which the virus can enter the body is capable of producing infection under proper experimental conditions. Which, if any, of these routes is used in nature in infecting the human is not known. But recent epidemiological investigations, all backed by some laboratory work, have seemed to point to contact, food, water, and insects as at least calling for further consideration. However, in no single instance has any worker or group of workers been able to trace the virus from one human host to another. While this is a most difficult task with any disease, for poliomyelitis it is even greater. It has been suggested that research workers, both in the laboratory and in the field, have been looking for and studying the wrong disease or wrong set of disease symptoms. It is not too difficult to think of poliomyelitis as a primary gastrointestinal disease with the organism being able to take on neurotrophism only because of some alteration within the host or within the invading organism.

This host factor is now being studied; everything from diet to racial stock is being considered, but little has been done to consider alterations in the virus. It has always been considered as a neurotropic virus which, through some remarkable and unexplained set of circumstances, was found in the stools. It might be more nearly correct to assume that it is primarily an intestinal invader which, through some remarkable and unexplained set of circumstances, can occasionally find its way into the central nervous system.

So here, too, no answers have been given, but ways have been found to study the problem. The questions in epidemiology are becoming much more clearly defined. The epidemiologist and the laboratorian now can combine forces to study particular phases of the problem. Truths must unfold under these circumstances. The problem is not simple, but it can be worked upon and ultimately solved.

It is important that the medical profession learn what it is that serves as a barrier to development of nerve cell involvement, or learn what it is that by its presence pushes the virus over into nerve tissue. This force, either positive or negative, is important for the balance apparently is very delicate —at least it is evasive. It is reasonable to assume that whatever it is that allows one person to have a harmless intestinal invasion and the next to develop extensive central nervous system pathology is in a very nice state of equilibrium. Either individuals or whole communities may be affected by some as yet unpredictable disturbance. It is not impossible to have a country-wide involvement with an epidemic as severe as that of the Eastern coast of 1916.

CHEMOTHERAPY

As yet there is no cure for poliomyelitis, but methods of searching for a cure have been developed and are being intensively utilized. The adaptation of the Lansing strain to mice and cotton rats makes chemotherapy studies possible. Monkeys never could be made available in sufficient numbers to

use for such extensive basic studies. They may play their part in certain critical tests before hopeful drugs are tried on children.

The method of approach has been to test those drugs, sera, and chemicals which because of their value in therapy of other diseases or because of their chemical or physical nature hold some promise of value in poliomyelitis. Of the many hundreds tested so far none has been reported as being of value. Kramer (22) reported that convalescent serum was of definite value in preventing infection in mice, using the Lansing strain of virus. He also reported there was no evidence of any curative effect. Many drugs may need be tried, but a year or two of failures has only prepared the way for ultimate success.

IMMUNIZATION

Hope for active immunization is rapidly disappearing. Many workers have reported on the failure of one attack in the experimental animal to produce solid immunity against re-infection. Protection is lacking against both heterologous and homologous strains. Re-infection seems to be almost universally possible if a different portal of entry is used for the subsequent inoculation. Careful clinical surveys of large numbers of patients tend to bear out the fact that repeat attacks in the human are not unusual. It appeared from at least one study that second attacks occurred with a frequency that gave an incidence rate among poliomyelitis cripples of about the same magnitude as occurred for the same age groups in the population at large.

In light of the present knowledge prevention must depend on control of environmental factors and possibly on chemotherapy, rather than upon specific immunization such as is available in other infectious diseases.

TREATMENT

Research has not been limited to the virus alone. Much has been done to study and improve therapeutic technics. Before rational treatment can be instituted it is well to know something of the pathological changes.

The disease has an array of misnomers. It certainly is not infantile paralysis. It does not limit its victims to infants and only a small percentage of those infected are paralyzed. The supposedly more scientific name, acute anterior poliomyelitis, is even more misleading. It is an *acute* infectious disease but its pathology is not limited to the gray matter of the spinal cord. The sympathetic nervous system, the posterior roots, the lateral columns, the basal ganglia, portions of the cortical structure, and the meninges are more or less involved in apparently every case where the nervous system is invaded. Non-nervous tissue, too, may very likely support growth of the virus. Sabin and others routinely recover virus from the well-washed intestinal wall of human and experimental cases.

With such extensive invasion clinical symptoms other than paralysis due to destruction of anterior horn cells must be expected. Much diligent histological and pathological study is needed to complete the understanding

of what happens in the human body once it has been infected, but certainly the disease is far more than one of the anterior horn cells.

With this somewhat extended concept of the infection it is only natural that the medical profession would be ready for the introduction of a newer and different method of treatment.

Sister Elizabeth Kenny, an Australian nurse, has advocated a different form of treatment based on a different idea of the symptoms of the disease. She even has developed a new terminology, which must be used in spite of the complications thus produced, simply because there is nothing better.

Kenny (23) contends the basic symptom of central nervous system poliomyelitis infection is "spasm". This is certainly the one most prominent symptom, and is present in all clinical cases. By "spasm" is meant a hyper-irritability of muscles, or a tonic contraction, or a fibrillation. She has taught that "spasm" is present not in the flaccid muscle but rather in the opposing muscle or muscle group. This "spasm" acts to pull the other muscle out of its normal resting length and to act as a brake, thus creating a situation of apparent paralysis. A muscle cannot produce motion when its opponent is fixed, spastic, or shortened.

This inability to move, coupled with the fact that efforts to contract produce pain in the muscle in "spasm", causes that muscle which is not necessarily directly or immediately affected by the central nervous system pathology to become "alienated". Literally, it is thrown out of the muscular economy and ceases to function. The "alienated" muscle is the one which previously has been called paralyzed. Therapy in the past has been directed toward this, overlooking the real offender and the obvious "spasm".

That this is not wild theory and uncontrolled imagination is shown by at least two facts. First, and of great importance, a therapeutic régime based upon this idea yields astonishing clinical results. Secondly, as yet unpublished research by several workers, principally R. Plato Schwartz (24) and his associates at the University of Rochester, shows that Kenny has described exactly what does happen. Electromyographic studies with a sensitive oscillograph show that there *is* "spasm" in the heretofore considered uninvolved muscle and action potentials are tremendously increased. Further, the "paralyzed" muscle may be served by a nerve capable of carrying stimuli, and reflex impulses can be demonstrated going from the "spastic" muscle to the one that is "alienated", or that which has been called paralyzed.

That an individual muscle can be thrown out of control, unable to contract in spite of an uninjured nerve, is a common experience of orthopedic surgeons. All have seen the inability of some patients to contract the quadriceps femoris after a knee operation or in the presence of other painful lesions of that joint. Prolonged physical therapy may be needed and exacting muscle re-education may be called for to re-establish function. Yet there is no true paralysis arising from nerve damage.

In addition to "spasm" and "alienation" Kenny has described a third condition which she has termed "incoordination". By this she means that set of symptoms having to do with the attempts of a patient to produce joint

motion by use of muscles other than the "alienated" ones or by muscles attempting to perform functions not commonly undertaken by them. Such action produces abnormalities of muscle balance and relationships which are well described by her term. These abnormal action patterns further contribute to and tend to maintain the state of "alienation". "Alienation"—or disfunction—bad as it is, may lead to permanent disability and deformity because of the resultant atrophy of disuse.

In addition to these three major symptoms of "spasm", "alienation", and "incoordination", Kenny recognizes that there may be disfunction because of complete destruction of motor nerve cells. Such a state is relatively infrequent and its presence is admitted by her only after appropriate treatment has failed to produce a return of function. The end results of this are, of course, paralysis which cannot be benefited by physical therapy.

Much unjust criticism has been directed at Kenny and her method of treatment by those who failed to appreciate that she recognized the existence of this condition. One of the real differences in the two schools of thought is that the older considers all muscle disfunction in poliomyelitis to be due to anterior horn cell destruction, while Kenny recognizes that loss of contractile power may be due to other processes ("spasm", "alienation", "incoordination") which are susceptible to appropriate therapy. The one thought, of course, holds forth limited hope for the patient while the other, as advanced by Kenny, admits of an active corrective and remedial régime.

"Spasm" is treated by the application of hot foments. This is aimed solely at relaxation of the muscle in "spasm" and should be looked upon merely as preparation of the affected part for the careful muscle re-education efforts designed at overcoming "alienation" and "incoordination".

Hot moist heat, to be most effective, should be applied as early in the course of the illness as possible, preferably immediately upon diagnosis. This form of treatment today should be used as dictated by Kenny, not because other technics may not be possible but because that advocated by her has been shown, after careful evaluation, to be good. There has been neither time nor opportunity to appraise variations. Hot foments are solely for the purpose of relieving "spasm" and pain. They have no effect on the disease process of the central nervous system, nor can they overcome other symptoms, with one possible exception. They may play a part in maintaining good circulation and good nutrition of local parts.

Re-education of muscles, aimed at overcoming "alienation", is started as early as pain and "spasm" will permit. Briefly, the basis of this form of physical therapy consists of re-creating an awareness in the mind of the patient of the existence of the muscle and its proper function. This result is accomplished first by fixing the patient's attention on the insertion of the "alienated" muscle, then by the gentlest passive motion. As the patient's condition warrants, carefully and completely supervised active motion is undertaken. Overcoming "incoordination", too, depends on skilful physical therapy and muscle action control.

It is not the purpose of this paper to present the detailed technics of

hot fomentation or muscle re-education. Suffice it to say such are markedly different from practices ordinarily employed. Yet once the reason for their use as advocated by Kenny is appreciated, they become rational and reasonable. Certainly they are efficacious. The Kenny method does not cure paralysis nor does it prevent it (although certain competent orthopedic surgeons with a wide experience in poliomyelitis have expressed the opinion that Kenny's methods may actually decrease the incidence of residual paralysis). However, there can be no doubt that patients treated by this method by well-trained technicians have a complete freedom from *all* contractures. There is no scoliosis and there is no joint stiffness. There is no urinary retention. Trophic ulcers are unknown. All pain disappears very quickly. Further, in the hands of skilled Kenny technicians respirators are not needed. Respiratory failure, according to the Kenny idea, is either bulbar in nature or due to "spasm" of muscles of breathing. Properly applied hot packs relieve this "spasm" and allow for the normal breathing process to be resumed. Bulbar poliomyelitis which, of course, ordinarily is harmed by the use of a respirator, is not amenable to treatment by the Kenny method for "spasm" is not the cause of breathing failure.

Immobilization by the use of splints or plaster casts has no place in the Kenny method. Such immobilization tends only to increase "spasm" by placing involved muscles on the stretch. It increases "alienation" by adding one more factor which, combined with the already present "spasm", makes it even more difficult for the "alienated" muscle to find its place once more in the muscle balance. In addition, immobilization by plaster or splints tends to interfere with circulation. This hastens atrophic changes and markedly delays regeneration of both muscles and nerves.

This is another phase of the Kenny régime which has been carefully analysed by laboratory investigation. Experimental animals have been subjected to motor nerve damage quite comparable to that found in poliomyelitis. A marked delay in recovery was experienced when the denervated part was immobilized. While immobilization by splinting has no place in this régime, no patient was ever handled more gently or more carefully than are those treated by Kenny technicians.

There are no miracles here. The same good results achieved in Minneapolis by Kenny have been had in New York, in Pittsburgh, in Winnipeg, and elsewhere. When patients have been treated for these newly described symptoms of an age-old disease by persons trained to apply well-known therapeutic modalities, much of the dread of infantile paralysis is removed. Deformities are prevented and patients who do not fully recover are in a condition to receive the maximum benefits from reconstructive orthopedic surgery.

SUMMARY

Much progress has been made in mastering poliomyelitis, but today if all further study were to stop there would be but little change over the public health practices of the past. The means of spread of the virus is not certain,

nor is it known how the virus enters the body; resistance and immunity are not yet subject to alteration through directed efforts; no quick laboratory diagnostic aids have been developed; there is no serum or drug to cure. This would indeed be a most dismal picture if it were not for the fact that in each of these areas basic knowledges have been developed, skills perfected, and workers trained.

An answer to each of today's problems is now entirely within the realm of the possible. For the most part, at least, a suggested way to the solution has been pointed out, and that way is being followed.

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Gonorrhoea—A Preventable Disease*

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GONORRHOEA is a communicable disease. As such it is subject to the same preventive principles that are applicable to other communicable diseases and the problem of its control can be approached in the same scientific manner. When we consider the roster of available knowledge of this disease, we should feel assured of the outcome of our efforts. We know the cause. Its clinical course has been widely explored. Today new methods of chemotherapy have made it possible to cure gonorrhoea with a despatch that would have been incredible as recently as ten years ago. Far more important, it is becoming increasingly clear today that gonorrhoea presents an opportunity for productive epidemiological study. However, with all weapons at our disposal, far more complete than in other diseases, we still fail to make a substantial gain against gonorrhoea. With each year numerous new infections appear among our population. With each year we carry the continuous burden of the costs of this disease. Gonorrhoea stands as the paradox of public health, controllable yet uncontrolled. In the past the reason has been largely a matter of attitude and approach. The public has met the venereal disease menace with the traditional tactics of the ostrich. Even some medical men have avoided the care of the venereal diseases because they did not consider them "nice" diseases. Public health officials, too, have frequently passed this problem by, and for the same reason. There are people whose interest can only be sustained so long as the venereal disease problem is attacked as essentially a moral problem. But fortunately attitudes are changing. The public, through intelligent education with emphasis on the health aspects not the moral aspect, has become more receptive to measures for control. Indeed, in British Columbia we have found this appetite for knowledge has provided our Board of Health with a heavy task in meeting it. Notable among recent professional attention to the gonorrhoea problem have been the scientific investigations of the American Neisserian Medical Society (1). Those who find that the prospect of gonorrhoea control perplexes them should read the publications of this group. Today we have a scientific approach. A phase of this science is to be found in epidemiology.

Features of the Disease of Epidemiological Importance

Gonorrhoea, as a disease, presents features of epidemiological importance. It is strictly a human disease, transmitted in the adult almost entirely through a

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direct human contact, sexual intercourse. The causal organism, the gonococcus, is readily susceptible to the detrimental effects of physical forces such as heat, drying, mild disinfectants. For a successful transfer of these organisms from man to man there must be protection of the gonococcus from these lethal physical forces, else otherwise the organisms would perish in the transfer. Sexual contact has provided this protection. A small affair—the inherent character of the causal organism—has thus determined the sexual association of the disease. Unfortunately this association of the disease, under the influence of moral prudery, has, in the past, hampered initiative to control it.

The disease is diagnosed by the demonstration of the gonococcus in a specimen of secretions collected from infected tissues. To make this diagnosis we have today two simple tests, the direct smear and the culture. At our Vancouver Clinic we have found that, among all male infections diagnosed during 1941, 89 per cent were diagnosable by a positive direct smear only, and among female infections 72 per cent were thus diagnosed. This is ample demonstration that, *provided the specimens examined are properly obtained,* the direct smear is a valuable diagnostic method. An important point we have noted in female gonorrhoea is the number of cases where we have obtained a negative smear of the cervix accompanied by a positive smear of the urethra. Among a group of female infections studied during 1940, 37 per cent were of this type. Examination of a cervical specimen only would have overlooked these important infections. Thus it is important that a physician completely examine the patient before he declares the patient negative. Particularly is this so where an exposure is known to have occurred. The culture as a means of demonstrating the gonococcus is unfortunately today limited in its use to clinics because of technical difficulties in handling of equipment. However, use in clinic practice has demonstrated its value and it is to be hoped that further research will provide means whereby it can be made available to private physicians. At our Vancouver Clinic 11 per cent of male infections and 28 per cent of female infections, usually long standing, often symptomless, were diagnosed by positive culture in the absence of positive direct smear examination. The culture is particularly useful in the examination of young women named as sources or contacts who give no history of symptoms. It is, as well, valuable as an additional test of cure. It is not only of clinical importance but as well of utmost public health importance to know the details regarding diagnosis. For example, there came to our attention an instance recently where a public health officer, asked to examine a group of young women named as sources of new gonorrhoeal infections, challenged the accuracy of the epidemiological information supplied to him, because his examination of these alleged sources proved negative. However, in his examination, he used only a direct smear. It is not unusual to have negative smear results and to obtain a growth of gonococcal colonies from the same material. In the absence of facilities for cultural examination, where epidemiological evidence of spread is strong, repeated examination of direct smears, carefully taken, is indicated. Care taken in diagnostic examination should be considerable since every infection which escapes attention continues as a potent untreated source of further disease.

Gonorrhoea has an incubation period of two to eight days, usually followed

by acute symptoms, particularly in the male, which bring the patient in for care. This short incubation is actually a protection against spread since for the most part, except among the very promiscuous and the prostitute, only one contact, the contact to the source, has occurred. This simplifies follow-up measurably, reducing the number of persons who must be investigated. If health officers could achieve an aim of bringing under control one infected contact for every new infection reported, a great deal of gonorrhoea would be eliminated in a short period of time.

The gonococcus fails to produce effective active immunity in an infected individual. Reinfection with gonorrhoea is not infrequent. We cannot depend upon the occurrence of infections in our young population to reduce the number of susceptibles. Nor is there any known method of passively inducing immunity. To protect young people we must reduce the prevalence of infection. In any given population the prevalence of gonorrhoea will be directly proportional to the number of sexual exposures which occur between infected persons and healthy persons. To reduce prevalence we must reduce these particular exposures. We can theoretically do this in one of two ways. We can disregard the identification of infected persons and attempt to control sexual intercourse—a fine theory but practically as impossible as changing night into day. Or we can place our emphasis on removing this health danger from sexual intercourse, whether promiscuous or marital, by finding and removing the infections, or failing this, or even with substantial progress in this direction, by providing *adequately* and encouraging the use of all means of prophylaxis for venereal disease—mechanical, chemical or both. Although I will support any measure which seems reasonably assured of promoting strengthened sexual conduct of our population, I do not believe I shall live to see the day when any individual or group will appreciably control human sexual relationships whether they be promiscuous or marital. Nor do I feel that it is the responsibility of the health department to dilute or contort its endeavour in this task. To me the health department must concentrate its energy on the job at hand—finding infections, treating them, removing them. In this way, although we may not control the means of spread we can render more infrequent the presence of the gonococcus on such occasions. To this end it is an important public health measure in gonorrhoea control not only to find infections, but as well to see that they receive adequate treatment and become cured. Every person harbouring the gonococcus must be considered infectious. This period of infectiousness extends from the date of exposure to the date of cure. If cure is not accomplished the patient continues infectious. A significant public health gain in this respect has come from the new sulfathiazole therapy. The period of time required to effect a cure has been substantially reduced. Before this new therapy the course of the disease was prolonged over a period of months. In the female, cases tended to persist as chronic infections, harbouring the germs over a long span of time. Therefore, before this drug, any group of patients remained infectious longer and to that degree the magnitude of their public health danger was increased. In reducing the length of this period of infectiousness there can be no doubt that this new drug has added considerably to our chance of controlling gonorrhoea.

The aim of the health officer must then be to place all infections under

adequate treatment both in the patient's own interest and in public health interest. Adequate reporting of new infections is an important aid here. Reporting of gonorrhoea is notoriously poor. Yet reporting provides the soundest evidence of our success or failure in control; at least it will provide this whenever it becomes anything like complete. It is absurdly unscientific to claim any success in gonorrhoea control in the absence of complete reporting. Reporting can be improved. When health departments provide something more active than a filing cabinet or an item in a statistician's record for the report submitted by a private physician, then private physicians will respond with conscientious reporting. With the increasing trend to governmental participation in the field of human health, there has been a concurrent increase in the volume of written reports required by one agency after another from the medical practitioner. The fountain pen may replace the stethoscope as the symbol of medical art. Naturally a physician, in the face of this expanding burden, is not likely to greet a request for another report in a co-operative manner unless it can be demonstrated that his co-operation is not empty of purpose. In gonorrhoea reporting can be made functional, an active phase of medical practice where, in return, the health department demonstrates an interest in the reported case by providing expert consultative service, by undertaking follow-up as related to the case, upon the physician's request, and by supplying free medication for the patient through his physician. In other words the case is to be reported by the physician so that his patient may receive the full benefit of an adequate treatment and public health program offered by the health department. Let service replace statistics as the reason for reporting. Health departments have never had a better opportunity than exists today to bring a real service to the patients under care of private practitioners. It is essential, too, to reach these cases since in numbers they will represent almost half of all infections under treatment. In addition to obtaining adequate care of these cases under private medical practitioners, the health department must provide care for many gonorrhoeal infections directly in its own clinics. In British Columbia we treat approximately 55 per cent of all reported gonococcal infections in our own Board of Health clinics. The management of these cases provides the health officer with the opportunity to practice what he preaches. What right has a health officer to expect more of a private practitioner than of himself? The proper management of the gonorrhoea patient is a subject that merits careful study in any program where successful control is sincerely desired.

THE MANAGEMENT OF THE GONORRHOEA PATIENT

It is the chronic experience of health departments that gonorrhoea patients fail to complete treatment. Especially today, with relief of symptoms occurring so rapidly under our new chemotherapy, will these patients fail to attend for the full program of treatment which produces their cure. There are clinics which report as few as ten per cent of all admissions satisfactorily completing treatment to the point of cure. Our Vancouver Clinic experience has been much more encouraging and we feel there is a reason for it—the method of caring for the gonorrhoea patient.

During 1940 and 1941 there were treated at our Vancouver Clinic 1291

gonorrhoeal infections, 884 male and 407 female. The larger number of these patients applied for care voluntarily, the remainder being referred by private physicians or being brought to our clinic as contacts by our epidemiological workers. Of the 884 male infections 74 per cent attended to a satisfactory conclusion of their treatment. Of the 407 female infections 82 per cent satisfactorily concluded treatment. These results were not accomplished through intimidation or legislation. They resulted from attention to the patient. There is probably no more important factor in venereal disease control than the proper attitude toward the patient on the part of the health department personnel whom the patient personally confronts, nor is there a more woefully neglected feature in venereal disease control programs than this.

Let us momentarily place ourselves in the shoes of our gonorrhoea patients. We have alarming symptoms. We are distressed, our distress aggravated by our general ignorance of the true facts regarding our illness. It is not necessary for the most part to point out to us that we strayed from the straight and narrow path. We are acutely aware of the fact. And then, too, we may not have. What are we looking for? First and foremost, protection of our identity, second cure of our disease, third sympathy and humaneness. We are likely to be young, in our early twenties, single, working but not particularly well-fixed financially. We are definitely on the spot. We do not wish our families to learn of our illness, nor our fiancés, nor our friends, nor our employers. We have heard that the government runs a clinic which we can attend. We decide to give it a try. Thus far everything has been up to the patient, but now it is up to the clinic personnel. If we must enter a dirty, dark, unattractive clinic, if we are shouted at, ordered around, intimidated, threatened, preached at, treated with casualness, caused pain, and numerous other indignities and annoyances, we are unlikely to return. If, however, in sharp contrast, we find a clean, well-lighted, pleasant clinic with every regard paid to our personal comfort, if we receive skilful and kind care with privacy, if we are assured protection of our identity, if we are made to feel that we have done the right thing in seeking treatment, we are likely to return. We feel that these people want to see us get better. We are not treated as though we are border-line criminals. This is not an exaggerated picture. I have seen clinics of both types. I have seen one clinic where as many as a dozen men stripped of every piece of clothing sat together in one room on hard wooden benches before the presiding doctor. I have seen another clinic where patients were handed a printed sermon on their responsibility as a result of their infection, which they had to sign before leaving on their initial visit. In our own province we once had a clinic which was to be reached only after a long climb up a dark set of stairs at the top of which was the accumulated filth of years of slipshod operation. There is little need to continue. The answer is obvious.

There is an additional sound reason for providing decent care for gonorrhoea patients other than that dictated by ordinary humanity. Every public health official should realize that a new patient represents a golden key of epidemiological information which, if it can be obtained, will open the way to further control. Furthermore the patient, in venereal disease control, is the only source from which this information is to be obtained. Let me repeat, *the known patient holds the master key to venereal disease control.* Treat him decently and that key—

the information regarding his exposure which he alone can give—will be the health officer's to open the doors to prevention. Fail in this and that key will never unlock these stores of information. The choice is not up to the patient as often as we would like to think. These young Canadian boys and girls, young men and women who are so early in their lives the victims of syphilis and gonorrhoea, are not a group detached from us. They have sprung from the same stock as we have. They are our brothers and sisters, our cousins, our friends, our fellow Canadians. When one reflects upon the general public attitude toward them, when one considers the grasping of their elders for the pelf of the world which ensnares the youth as victims of venereal disease, it is a constant surprise that more are not victims, that so many energetically co-operate with us to protect their contemporaries. The epidemiological picture of venereal disease lies in the information which each patient holds. Control lies in its proper use when obtained.

INFORMATION WHICH THE PATIENT HOLDS, AND ITS USE

The means by which a gonorrhoeal infection has spread has involved a relationship between a man and a woman of a highly personal nature. The patient's first natural reaction is to maintain a secrecy about this relationship, especially where it involves another individual for whom he feels he carries an obligation of protection. This reaction is certain to be intensified by an austere moralizing about his conduct. I know of no method of intimidation or legislation which will pry from patients any consequential amount of useful information. On the other hand if we gain the confidence of the patient we can learn much.

There are definite rules to be followed in interviewing a patient which can be usefully reviewed here:

1. Interviewing must be done privately and by personnel, trained in a knowledge of venereal disease and all of its implications. In our clinics we use workers trained in social services. Physicians treating the patients are especially qualified for this work.
2. No request for names of contacts should be made before a diagnosis is established.
3. The identity of the patient must be protected at all times from the contacts whose names he divulges. This guarantee must be given and *it must be kept.*
4. Emphasis should be placed, in interviewing the patient, on the fact that his personal responsibility lies in protecting the health of his contact through identifying the contact and bringing the contact under medical care. He must understand, too, that he protects the health of others from this contact who proved a health danger to him.
5. All follow-up of contacts should be done by skilled personnel and by personal visit. Medical health officers should do this work in their own districts personally. The contacts of those cases under private physicians are best followed up quietly by the physician himself, especially in family groups. If he does not wish to do so, the medical health officer should be ready to assist.

6. The contact is allowed choice of whether he or she is examined by a private physician or by the health department.
7. The identity of contacts should be subject to the same protection as that of the original patient.

   No information regarding a patient or a contact should be given to any person or agency, except a physician, without a signed consent from the patient specifying the person to whom information may be given. The only exception to this rule occurs in the case of juveniles under 16 years of age, where parents or guardians should be informed. Welfare agencies or police departments are *not* exceptions to this rule.

There is a widely prevailing tendency, where the venereal diseases are concerned, to inflict upon the police the role of epidemiologist. One cannot too strongly condemn this practice. Police officers are not entitled to this confidential medical information and for the most part do not wish it. They have no training in the medical aspects of venereal disease. To use them, it seems to me, borders on direct intimidation of individuals and certainly tends to make patients regard themselves, and the public regard them, as semi-criminals.

We have consistently employed these principles in British Columbia over the past five years. The tracing of venereal disease contacts is admittedly a difficult procedure, but much can be done. During 1941 there came to our attention information for follow-up from two main sources:

a. From patients attending our clinics.
b. From other agencies treating patients including private physicians, health departments of other provinces, and from medical officers of the Armed Forces.

In the first or clinic group 451 or 70 per cent of all patients upon interview supplied information, though of varying usefulness, regarding the exposure which resulted in their infection. From this information there were identified and brought under medical examination 203 alleged sources of infection among whom examination results revealed 155 gonorrhoeal infections and 18 syphilitic infections. Besides these sources an additional group of 100 contacts to these infections were named, of whom 74 were examined, revealing 41 gonorrhoeal and 3 syphilitic infections. These results reflect the accuracy with which information can be obtained through a sympathetic, skilful approach to a patient. Here, too, is represented a sizeable potential of fresh venereal disease brought under control.

From the second group, treatment agencies other than our clinic, information regarding 581 different persons requiring investigation was received. These for the most part involved alleged sources of new infection, both syphilis and gonorrhoea. A small number of lapsed patients were included for attention. Of these 581, 185 or 32 per cent were identified, located and examined. One hundred and six or 57 per cent of those examined were sources found infected. Nineteen syphilitic infections and 95 gonorrhoeal infections were thus brought under medical care. The results of this second group represent the co-operative effort of several agencies—other provincial health departments which investigated 104 of the group, from information sent out from British Columbia, finding 18

gonorrhoeal infections and 3 syphilitic infections; military medical officers; our own British Columbia health officers and private physicians, as well as our own department. Surely here is the answer to the problem on a national basis. Our federal health department, dismally inert in the venereal disease problem, should reflect on this picture.

But these results are not the whole epidemiological gain to be made from information which each patient holds. If we carefully analyse the background of each new infection and then study the aggregate picture presented by a considerable series of cases, we will begin to see problems which must be dealt with successfully if young people are to be protected from gonorrhoea and syphilis. The greatest single menace to successful venereal disease control is thus revealed to be prostitution. Among 704 consecutive male gonorrhoeal admissions analysed at our Vancouver Clinic during 1940 and 1941, 276 or 40 per cent contracted their infection through exposures to prostitutes. In the face of this single statistical fact who can logically argue that the diseased, illegal, mercenary, vicious prostitution racket is any other than a filthy, rotten cesspool in which our young people have their health broken. And yet we find politicians, citizens, fathers, yes, even medical health officers supporting the existence of bawdy houses in their communities—as protection for their virtuous young women. A farce of medical inspection is carried out. Young men continue to become infected, their wives suffer secondary venereal disease attack in silence and the exploiters pour their illegal profits—high rentals, easy take—into their pockets and pump their local mouthpieces to pour out more propaganda for their business. Williams, in 1940 (2), discussed the problem of commercialized prostitution—the bawdy house—before this Association, pointing out its vicious background of disease. Any health officer can learn a similar lesson among his cases by epidemiological study.

Then, too, a study of our cases showed us that carelessly operated beer parlours present a happy hunting ground for the prostitute. This type of prostitute lolls about, soliciting her trade among the adequately befuddled male patrons. From the patient we find the only answer to prevent her activity, to reduce her accessibility to young men, a complete segregation by a solid wall between men's and ladies' accommodation in beer parlours so that her signalling is not visible to male patrons.

Such then are some of the lessons to be learned through epidemiological study of venereal infections. It is the direct duty of the medical health officer to learn these lessons and to see that his community learns the truth about venereal disease.

CONCLUSION

Gonorrhoea and its impact upon our social structure can be reduced today as never before in its centuries-old history. It is among young people that gonorrhoea strikes with its greatest force—75 per cent of all infections occur between 15 and 29 years. The costs in ill health, misery, social wreckage from this human plague are of great consequence. It is vital that our young men and women in industry be protected—and they can be. It is even more vital that our men in active service be protected—and they can be. It is the responsibility

of public health organizations, *as much the Federal* as the Provincial, to bring protection. I firmly believe that gonorrhoea, and syphilis too, can be controlled:

1. If an energetic, vigorous administrative program is put into operation for control. Substantial support of the Federal Health Department, on a national scope, has been lacking and is urgently needed. A Federal Division of Venereal Disease Control should be set up with adequate budget and expert personnel.
2. If commercialized prostitution is suppressed wherever it rears its ugly head. Laws exist adequate for this purpose. An aggressive nation-wide attack against this traffic, under Federal health department stimulus, is badly needed. Military officers should insist on removal of prostitutes from the vicinity of their districts by legal authorities.
3. If adequate decent treatment is made readily available to every infected patient.
4. If education of young people in a frank, open, instructive manner, regarding venereal disease is carried out. All avenues of education—the press, the radio, and the public platform—should be made available for this purpose.
5. If sources and contacts of known infections are persistently investigated and given proper and kind care when brought to attention.
6. If we subject this problem to the same scientific research that we apply to other communicable diseases.
7. If we cease our moral approach and replace it with a sound health approach to the problem, leaving the moral phases to those institutions whose responsibility it is to handle them—the church and the home.

We can control gonorrhoea, and syphilis, if we bury our prejudices and apply the means at our disposal with energy and persistence and with full co-operation of all agencies, civilian and military, from coast to coast.

SUMMARY

1. Gonorrhoea is a serious communicable disease which is controllable but which as yet is largely uncontrolled.
2. Means are available today for control as never before in the history of this disease.
3. The known patient is the key to control. He deserves humane care and in return will be a golden key to important epidemiological information.
4. From such information the pattern of spread is determined, and measures for control are indicated.
5. Particularly in our present national emergency is it vital to protect young people from this serious health threat.

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Western Equine Encephalitis*

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LAST summer, there occurred in the Prairie Provinces of Canada and in the Western United States the largest epidemic of encephalitis in humans ever recorded on this continent (1). The speakers to follow will tell you about that epidemic. The purpose of these remarks is to acquaint you with current opinion regarding the nature of the infectious agent of this disease and its method of spread.

Western equine encephalitis of man and horse is caused by a virus. This virus has been isolated repeatedly from both sources and has been shown to be a distinct entity by serological and cross-protection tests. That is to say, the viruses of similar diseases, *e.g.*, the Eastern variety of encephalitis and St. Louis encephalitis, have been shown to be serologically different. The disease of 1917 to 1919, known as encephalitis lethargica, is also believed to be caused by a different agent. Unfortunately, all efforts to isolate a virus from this disease have failed so that we have no experimental evidence to prove the difference but this failure may, in itself, be accepted as fairly good grounds for the belief that the two are distinct etiologically. It has been suggested that the name "encephalitis lethargica" should be dropped and that the terms "von Economo's disease" or "the Vienna type of infectious encephalitis" be substituted (1).

Encephalitis in horses due to the Western equine strain of virus is an old story in the Western United States and Canada. Outbreaks have been reported periodically since 1847. Some horse epidemics have been tremendous. In the San Joaquin Valley in California, in 1930, some 6,000 horses and mules were infected and about half of them died. In 1935, another epidemic occurred among horses, involving the Northern Prairie States and the southern parts of Manitoba and Saskatchewan.

The largest recorded epidemic in horses occurred in 1937 and 1938. It involved all three Prairie Provinces and many states in the United States. The Bureau of Animal Industry of the United States Department of Agriculture reported a general morbidity for the 39 states involved in the 1938 outbreak of 23.6 cases per 1,000 head, with a total of some 264,000 cases. The mortality rate was 21.4 per cent. Dr. J. S. Fulton (2), of the University of Saskatchewan, estimates that Canada lost about 15,000 horses as a result of this epidemic. In 1939 and 1940, there were a few sporadic cases in horses. Last summer (1941), the number of cases showed an increase and Dr. E. A. Watson, of the Animal Diseases Research Institute, is of the opinion that

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there were between 250 and 350 cases in each of the Prairie Provinces, mostly mild and with a low mortality rate.

The first recorded isolation of Western equine virus from horses was performed by Meyer, Haring and Howitt (3) in California, in 1930. In Canada, the first isolation of the virus from horses was accomplished in 1935 at the Animal Diseases Research Institute, Ottawa, by Walker and Mitchell (4), and at the University of Saskatchewan by Fulton (2).

In 1932, Meyer (5) suspected that the virus was affecting humans. This suspicion was based on clinical histories and the pathological findings of one fatal case. No virus was isolated from these cases. It was during the great horse epidemic of 1938 that Meyer's associate, Howitt (6), succeeded in isolating Western equine virus from a human case. In this same year, a number of human cases were seen in Saskatchewan and reported by Gareau (7). Although virus was not isolated from any of these Canadian cases, the clinical picture, pathology of fatal cases, and the development of virus neutralizing antibodies leave little doubt as to the diagnosis. In the following year (1939), a human case came to autopsy in Saskatchewan and Fulton (2) was successful in demonstrating Western equine virus in brain tissue using guinea pigs and chick embryos. He showed that guinea pigs, previously immunized with a vaccine, were resistant to this virus and, further, that an immune serum prepared by the inoculation of horses with Western equine encephalitis vaccine would protect guinea pigs against the virus isolated from the human brain.

The pathology of the acute disease has been described by several authors. Dr. Moore, of Regina, has had an opportunity to compare human material from the 1938 and 1941 epidemics and I am indebted to him for these notes. Oedema of the brain is a notable feature and in some cases a pressure cone is seen. The meninges show oedema and hyperaemia. Microscopically, the unit lesions are cuffing made up largely of lymphocytes, with a few macrophages and polymorphs, and cellular infiltration with destruction of nerve tissue wherever it may be. Almost all the infiltrating cells are lymphocytes. The cerebellum suffers little in comparison with the other parts of the brain. Cerebral white and gray matter, pons and medulla, all show focal destruction of nerve tissue and cuffing. In the cord, the anterior horn cells show inflammation and degeneration. Dr. Moore expressed the view that, from the pathologist's point of view, the disease is a polio-encephalitis.

It is important to realize that the identification of the virus of Western equine encephalitis is an expensive and time-consuming task. To begin with, this virus is very labile and requires special precautions for its handling. It will remain viable for long periods in the dried state and, if the infected tissue is immersed in 50 per cent glycerine saline, buffered to pH 7.4 and kept cold, it will survive for several months. If these precautions cannot be taken, then specimens should be obtained immediately after death and inoculated into susceptible animals or embryos with the least possible delay. Also, it is probable that the chance of finding the virus is greater when the specimen is taken early in the course of the infection.

To demonstrate the virus in an infected specimen, animal or chick-embryo inoculation must be employed. Intracerebral inoculation of guinea pigs is the method most frequently used and even this drastic treatment of many guinea pigs may result in nothing more definite than a rise in temperature in a portion of them. Passage of brain tissue from these pigs to others, with repetition of this performance four or five times, may result in "stepping up" the virulence of the strain until it is capable of producing paralysis, followed by death of the pig in a few days. This must be followed by cross-protection tests, using known sera or animals immune to known viruses, before one can be certain of the identity of the virus under investigation. For all these reasons, one thinks twice before requesting the identification of the causative agent of a disease suspected of being caused by a virus.

A much simpler and more frequently used procedure is the virus neutralization test. Reference has already been made to virus neutralizing antibodies. The blood sera of human beings and animals who have been vaccinated, or who have been infected and recovered, develop a capacity to neutralize virus. This can be demonstrated by mixing virus of known strength with the serum to be tested and inoculating the mixture into susceptible animals or into eggs containing developing chick embryos. Survival of the animals or embryos thus inoculated, is taken as evidence that the serum under test contained virus antibodies.

There can be no doubt that the causal agent of last summer's human epidemic was again the Western equine strain of the virus. According to the last report available, Fulton has obtained virus from brain tissue from human cases autopsied by Moore in Regina.

Similar work was going on simultaneously in the United States. Cox (8) and his associates of the Rocky Mountain Laboratory at Hamilton, Montana, have reported the isolation of the Western strain virus from human cases. No other virus was found and this was considered to be important because it was suspected that the St. Louis virus might be responsible for some of the cases.

As further evidence that the Western strain of virus was responsible, we have the complement-fixation test findings obtained by Casals and Palacios (9) at the Rockefeller Institute. This procedure is based on the use of virus suspensions as antigens and opens up interesting possibilities. They used the viruses of Eastern and Western equine encephalitis, lymphocytic choriomeningitis and St. Louis encephalitis, and found the Manitoba sera positive only for the Western strain.

It should be mentioned that Casals also obtained virus from human brain material from Winnipeg. An antigen was prepared from this virus which fixed complement specifically with known Western equine encephalitis immune serum.

The methods of spread of the virus and the portals through which it enters man and animal are at present unknown. The human epidemic of last summer appeared to arise from many points simultaneously throughout the affected area rather than spread from a single focus. Its development

might be likened to that of a rash. There was no evidence of a person-to-person spread nor was any common vehicle, such as milk or water, incriminated.

It has been noted by several observers that outbreaks of the disease in horse and man do not necessarily coincide. This holds true for epidemics as a whole and may be a conspicuous feature of certain localities in an epidemic area. Last summer, it was not uncommon to find numerous human cases in districts where there were no horse cases, and vice versa. To be brief, there is no evidence of direct connection between human and equine cases apart from the fact that they are caused by the same virus.

There is one factor which might be mentioned because of its possible bearing on the above conclusions and that is, the occurrence of a very large number of mild and missed infections. There is good evidence that they do occur and they may have an important part to play in transmission.

Because of the nature of the development of an epidemic, and because of the lack of evidence of spread from man to man, or horse to man, experienced observers believe that the disease is transmitted by a vector, or vectors, from a widespread reservoir of infection, to man and to horses. The fairly general acceptance of this hypothesis has influenced the direction of investigation.

The search for reservoirs of infection has disclosed that the virus may be found in deer and prairie chickens in the natural state (Cox) (8); in the Richardson ground squirrel (Gwatkin) (10); and in *Culex tarsalis* mosquitoes (Hamon et al.) (11), although this latter observation is taken as indicating a possible vector rather than a reservoir. The same observation applies to the finding of the virus in an assassin bug in Kansas (12).

Since it is known that a search for the virus itself may well be a failure, the sera of birds and animals under suspicion have been examined for virus neutralizing antibodies, their presence being taken as evidence of past or present infection. This procedure has brought under suspicion several varieties of domestic and wild birds, domestic animals and rodents (13).

The study of the vector problem is being approached from two directions: the examination of material collected in the field, and experimental studies in the laboratory. As already noted, mosquitoes and assassin bugs caught in the field have been shown to be infected. In the laboratory it has been shown that several species of *Aedes* can transmit the disease from animal to animal (14). The same result has been obtained with the tick, *Dermocenter andersoni* (15). In the case of the mosquito, the virus appears to multiply in its gut but does not, so far as is known, go through the gut wall. In other words, it appears that the mosquito does not suffer from a generalized infection. The virus is not passed on to offspring and larvae swimming in water containing virus do not produce infectious mosquitoes (16). As an obstacle to the acceptance of the mosquito vector theory there is the repeated observation that the disease may be epidemic in drought areas.

Biting flies have been suspected, *e.g.*, the *Stomoxys calcitrans*, a small, black stable-fly. Bedbugs, lice and fleas can be ruled out if we consider the living conditions of many of last summer's victims. There is no evidence at present that these insects can transmit the virus.

A point of fundamental importance in considering the vector problem is that, if it is to operate, the vector must have access to the virus, which means that the latter must be accessible in some place other than the central nervous system. Unfortunately, too little is known about the distribution of the virus in man and animal. We do know that it can be found in horse's and experimental animals' blood in the early stages of infection and then for possibly only a day or two. Mitchell and Walker (17) have shown that the virus may be found in the blood of birds, especially young birds, but they qualify this observation by pointing out that, in their experiments, the inoculations were made subcutaneously. Most evidence seems to indicate that however the virus is introduced into mammals it fairly quickly localizes in the central nervous tissue.

SUMMARY

The human epidemic of encephalitis which affected the Prairie Provinces last summer was caused by the virus of Western equine encephalitis.

The virus is very labile but may be isolated and identified by serological and cross-protection tests.

There is evidence that, in addition to man and the horse, other mammals and birds are involved and it has been suggested that one or more of these may constitute a reservoir of infection.

Because of epidemiological and experimental findings, the view is widely held that a vector or vectors are involved.

Insects have been found infected in nature and it can be shown, experimentally, that mosquitoes and ticks are capable of transmitting the infection from animal to animal.

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Encephalomyelitis in Saskatchewan, 1941*

(Preliminary Report)

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Province of Saskatchewan

AT the twenty-ninth annual meeting of this Association, held in Winnipeg in September, 1940, Dr. Urban Gareau, Paediatrician, of Regina, and Dr. J. S. Fulton, Veterinary Pathologist of the University of Saskatchewan, Saskatoon, reported an outbreak of human encephalomyelitis which occurred in Saskatchewan during the summer of 1938. Their studies indicated that the Western equine virus was the causative factor in the epidemic disease in man and horses.

In the summer of 1941, Saskatchewan, in common with the Province of Manitoba and the States of North Dakota and Minnesota, experienced a severe epidemic of encephalomyelitis in man. Five hundred and forty-three cases were reported, with 44 deaths. Serological examinations and examinations of post-mortem material indicated that the epidemic was due to the virus of equine encephalomyelitis of the Western type.

The first cases, four in number, were reported during the last week in July and were brought to Regina for hospitalization. (One case had been reported in May and one in June.) In August 354 cases, or 83.6 per cent, occurred, and in September, 74 cases (13.4 per cent). There were eight cases in October and only one in November. The greatest number was found in the week ending August 23rd, when 180 cases, or 33 per cent of the total, were reported. The distribution of the cases by onset is shown in table I.

Of the 543 cases, 359 were male (66 per cent) and 180 female (33 per cent). In other words, there were two male cases for each female. Forty-five were under one year of age (24 male, 19 female, and 2 not stated). This was 8 per cent of the total. No deaths were reported in this age group.

In the age group 1 to 6 years there were 38 cases (23 male, 14 female, and 1 not stated). This was 7 per cent of the total. Two females in this group died.

In the age group 6 to 20 years there were 113 cases (66 male and 47 female). This was 20 per cent of the total. One male and three females died in this group. Therefore, under 20 years 35 per cent of the cases occurred and only 5 deaths.

In the age group 20 to 50 years there were 173 cases (135 male and 38 female). There were seven males to two females in this group.

*Presented at the thirty-first annual meeting of the Canadian Public Health Association, held in Toronto, June 1-3, 1942, in conjunction with the twenty-eighth annual conference of the Ontario Health Officers Association.

TABLE I

ENCEPHALOMYELITIS, SASKATCHEWAN, 1941
Distribution of Cases by Onset

ONSET		
Month of:	Number of Cases	
May	1	
June	1	
July	4	
Week ending:		
August 2	3	
" 9	15	
" 16	107	396 or 72.9%
" 23	180	
" 30	109	
" Not stated	33	
September 6	39	
" 13	26	
" 20	7	
" 27	4	
" Not stated	1	
October 4	8	
" 11	1	
" 18	2	
November 1	1	
" 15	1	
Total	543	
Onset by months:		
Prior to August	6	
August	453	
September	75	
October	8	
November	1	
	543	

Age and Sex Incidence

The incidence according to age and sex is presented in tables II, III, and IV.

TABLE II

ENCEPHALOMYELITIS, SASKATCHEWAN, 1941
Cases Under 1 Year according to Age and Sex

AGE GROUP	CASES				Per cent of Total Cases	DEATHS			
	Male	Female	Not Stated	Total		Male	Female	Not Stated	Total
"Baby"	3	2	1	6					
Under 1 month	1	–	–	1					
1– 2 months	2	5	1	8					
2– 3 "	5	5	–	10					
3– 4 "	6	3	–	9					
4– 5 "	2	–	–	2					
5– 6 "	–	1	–	1					
6– 7 "	2	1	–	3					
7– 8 "	1	–	–	1					
8– 9 "	–	–	–	–					
9–10 "	1	2	–	3					
10–11 "	1	–	–	1					
11–12 "	–	–	–	–					
Totals	24	19	2	45	8.3	Nil			

TABLE III

ENCEPHALOMYELITIS, SASKATCHEWAN, 1941
Cases 1 to 20 Years according to Age and Sex

AGE GROUP	CASES				Per cent of Total Cases	DEATHS			
	Male	Female	Not Stated	Total		Male	Female	Not Stated	Total
1– 2 years	8	5	–	13		–	2	–	2
2– 3 "	10	3	1	14		–	–	–	–
3– 4 "	2	3	–	5		–	–	–	–
4– 5 "	1	2	–	3		–	–	–	–
5– 6 "	2	1	–	3		–	–	–	–
Totals	23	14	1	38	7	–	2	–	2
6–10 years	16	14	–	30		–	–	–	–
10–15 "	21	18	–	39		1	–	–	1
15–20 "	29	15	–	44		1	1	–	2
Totals	66	47	–	113	20	2	1	–	3

TABLE IV

ENCEPHALOMYELITIS, SASKATCHEWAN, 1941
Cases Over 20 Years according to Age and Sex

AGE GROUP	CASES				Per cent of Total Cases	DEATHS			
	Male	Female	Not Stated	Total		Male	Female	Not Stated	Total
20–25 years	34	12	–	46	8.3	2	–	–	2
25–30 "	21	6	–	27	5.	1	–	–	1
30–35 "	26	6	–	32	6.	1	1	–	2
35–40 "	11	5	–	16	3.	1	1	–	2
40–45 "	20	5	–	25	4.6	1	–	–	1
45–50 "	23	4	–	27	5.	2	1	–	3
50–55 "	22	13	–	35	6.4	3	–	–	3
55–60 "	19	8	–	27	5.	2	3	–	5
60–65 "	15	11	–	26	4.8	3	2	–	5
65–70 "	21	8	–	29	5.3	2	4	–	6
Over 70 years	9	11	–	20	3.7	2	5	–	7
Not stated	25	11	1	37		1	–	1	2
Totals	246	100	1	347	64	21	17	1	39

Geographical Distribution

The south-east and central parts of the province were mostly affected, with an area around Yorkton reporting several cases. Cases occurred in 141 municipalities (figure I).

There were 114 cases (21 per cent) south of a line running east and west through Weyburn.

There were 267 cases (49 per cent) between a line running east and west through Weyburn, and a line east and west through Regina. Therefore, 381 cases (72 per cent) occurred south of a line through Regina.

There were only 21 cases north of a line east and west through Saskatoon.

Of the cities, Regina reported 87 cases, Moose Jaw 62, Weyburn 22, Yorkton 7, Saskatoon 7, and Swift Current 3 (figure II). No cases were reported from North Battleford or Prince Albert. The total in cities was 188, or

34.7 per cent of the cases. This was holiday time, so that many of the city cases had been in the country for holidays.

In Saskatchewan equine encephalomyelitis was first recognized among horses in 1935, when it appeared mostly in southern Saskatchewan. In 1936 the disease was less severe. In 1937 it recurred and covered most of the province. During 1938 it was estimated that 52,500 cases of the horse disease occurred in Saskatchewan, with over 15,000 deaths. In 1939 a vaccine against the disease was

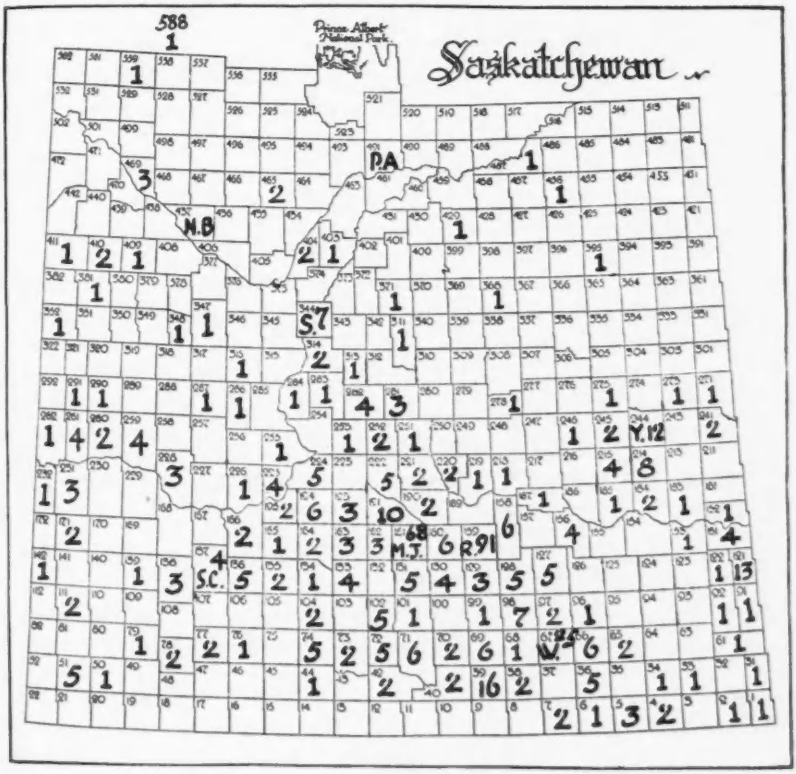

FIGURE I

Distribution of Cases of Encephalomyelitis in the Province of Saskatchewan, 1941 (543 Cases with 44 Deaths).

used in horses and some 450,000, or over half the horse population of the province, were vaccinated. In that year the horse disease was not so prevalent. In 1941, when interest in protecting horses had waned, the fourth epidemic was experienced, but it did not correspond with the occurrence of the human epidemic. For instance, around Stoughton there was quite an epidemic (50 cases) among the horses and only two cases in humans. Around Humboldt the horse epidemic was fairly severe but only one human case was reported in that area.

Mosquitoes were very prevalent in the southern portion of the province during the time of this epidemic. However, this was not the case in the northern portions of the province and north of a line drawn east and west through Regina.

At the beginning of the outbreak a committee of Regina physicians was appointed to co-operate with the city Medical Health Officer, Dr. George R. Walton, and the Department of Public Health, to study cases in that area and as well the clinical features of those hospitalized. A total of 162 cases were

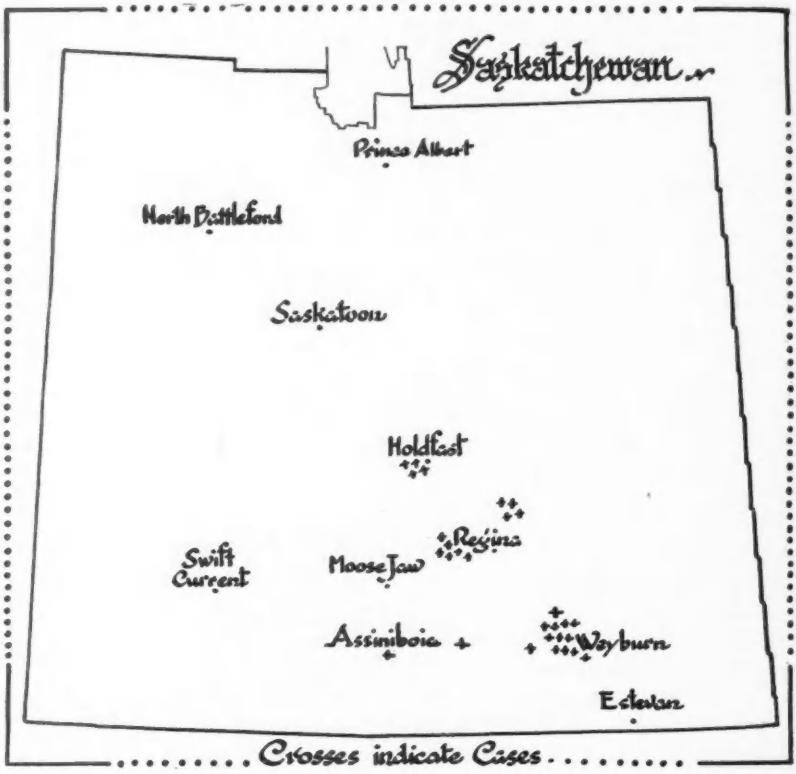

FIGURE II

Distribution of Cases of Encephalomyelitis in Cities, Saskatchewan, 1941

treated in the two Regina hospitals, and I am indebted to Dr. Urban Gareau of Regina, Dr. Donald Moore, Pathologist of the two Regina hospitals, and Dr. George R. Walton, City Medical Officer of Health, for the following information respecting these cases (table V).

Of the 162 cases, 66 were under 14 years of age, 51 were between the ages of 14 and 50 years, and 45 were over 50 years of age. There were 54 females and 108 males. While the charts of 162 cases were studied, it will be apparent

TABLE V

ENCEPHALOMYELITIS, SASKATCHEWAN, 1941
Age and Sex Distribution of Cases Hospitalized in Regina

Age	Male	Per cent of Females	Female	Per cent of Females	Total	Per cent of Total	
0– 4	19	17.1	21	41.3	40	24.7	
5– 9	10	9.0	4	7.8	14	8.6	33.3
10–14	10	9.0	2	3.9	12	7.4	
15–19	6	5.4	1	2.0	7	4.3	
20–29	14	12.6	2	3.9	16	9.9	
30–39	8	7.2	3	5.9	11	6.8	
40–49	13	11.7	2	3.9	15	9.3	
50–59	13	11.7	6	11.7	19	11.7	53.7
60–69	14	12.6	7	13.7	21	13.0	
70–79	3	2.7	2	3.9	5	3.1	
Not Stated	1	.9	1	2.0	2	1.2	
Totals	111	99.9	51	100.0	162	100.0	

that the totals do not agree in each of the signs and symptoms recorded, as some of the charts failed to indicate the existence of certain signs and symptoms.

Symptoms

One hundred and eight complained of headache, 10 of backache, and 7 of pain in the neck; 26 of malaise, 13 of nausea, 13 of constipation, 3 of diarrhoea, and 6 of dizziness. Less common complaints were insomnia, pains in the legs and abdomen, difficulty in speaking and swallowing, weakness, blurred vision, etc.

Signs

Seventy-one had fever, 25 listlessness and drowsiness, 20 irritability and restlessness, 11 convulsions, 7 rigidity of back or limbs, 6 twitching, 6 hypersensitiveness, and 4 chills. There were two or three complaints of unsteady gait, dullness and mental confusion, nervousness, stupor, incontinence of urine, etc.

Physical Examination

The pupils reacted normally in 54 cases and sluggishly in 4. Photophobia was present in 11.

Neck rigidity was present in 68 cases and absent in 22. Opisthotonos was found in 2.

Tonsils were inflamed in 4 cases and 1 case had a cervical adenopathy.

Chests were all negative. Seven cases showed some heart involvement.

Central Nervous System

No cranial nerve involvement was found except in two cases. Kernig was present in 7 cases. Babinski was present in 20 cases. Reflexes were normal in 47 cases, sluggish in 15, and hyperactive in 56.

The mental state was normal in 34 cases and confused in 16. Drowsiness was present in 30, unconsciousness in 6, and irritability in 4.

The fontanelle was tense in 7 cases. Tremors were present in 6, convulsions in 9, twitchings in 5, poor coordination in 3, muscular weakness in 2, spasticity in 9, pain on movement in 4, bladder incontinence in 4, and bowel incontinence in 2.

Treatment

One hundred and sixteen cases received 2,780 cc. of serum from immunized horses. Of these, 108 received the first dose on the first or second day of admission to the hospital. The other 8 cases received the serum late. Forty-six cases did not receive serum. The results were as follows:

	Serum administered early (108 cases)	No serum (46 cases)
Complete recovery	9.3 per cent	23.9 per cent
Apparent recovery	31.5	17.3
Improved	48.1	45.7
Unimproved	2.8	2.2
Died	8.3	10.9

Of the 17 fatal cases, 5 received no serum and 5 received it when moribund, but 7 received amounts varying from 10 cc. to 150 cc. four to five days before death.

Other forms of treatment were the administration of 50 per cent glucose solution intravenously (51 cases), chemotherapy (43 cases), convalescent poliomyelitis serum, spinal drainage, high fluid intake, and sedatives. None of these methods appeared to have any special value in hastening recovery.

The condition of the patients on discharge was as follows:

Recovered	61 cases	(37.7 per cent)
Improved	82 "	50.6 " "
Unimproved	2 "	1.2 " "
Expired	17 "	10.5 " "

Thirty-four cases (20.9 per cent) were discharged with residual signs. Of the 17 deaths, 2 were in the 66 cases under 14 years of age; 3 were in the 51 cases between the ages of 14 and 50 years; 12 were in the 45 cases over 50 years of age. In other words, over 25 per cent of those over 50 years who took ill with encephalomyelitis died.

Pathological Findings

The pathological findings of Dr. D. Moore, Pathologist for the two Regina hospitals were as follows:

One hundred and fifty-eight had lumbar punctures, and the cell count was elevated. In 69 cases a second puncture was done, and the second cell count was usually lower than the first. There was some increased pressure in the spinal fluid; globulin was increased. The blood cell count showed an increase in about half the cases. In the autopsies (12) the brain and spinal cord showed oedema;

the meninges were congested; and there was hyperaemia. There was a distinct cupping or "collar of cells" around the brain vessels, with exudation of cells into the space. There were also focal areas of degeneration or necrosis in the brain. The white matter of pons and medulla was affected more than the cortex. The complications found were pulmonary oedema, lungs heavy, with primary broncho-pneumonia.

Sequelae

Autopsies were done on one infant 7 months old in January, 1942, and one adult (female) aged 31 years. Both had been under observation since their initial disease in the summer of 1941. The baby had had intermittent vomiting and dyspnoea before death. The woman seemed to be doing well but suddenly became violent and died in two days. The findings were: increased necrosis, some gliosis, and more macrophages in the necrotic areas and perivascular cuffs.

Investigations of Dr. J. S. Fulton

I am indebted to Dr. J. S. Fulton, Veterinary Pathologist, University of Saskatchewan, Saskatoon, for the following summary of the work done during 1941 human epidemic in co-operation with the Department of Public Health and the physicians of this province:

Although it was now well established that humans were susceptible to the virus of equine encephalomyelitis, and that cases had previously been recognized in the Province, it was of course considered essential that the causative agent be isolated from as many cases as possible during the extensive human epidemic of last year, appreciating the fact that various viruses had played a part in similar outbreaks. Plans were laid to secure suitable material for virus isolation, but owing to varying circumstances it was found difficult to secure brain tissue from fatal cases. In all, nine brains were examined, from two of which virus was obtained. Because of the dearth of brain tissue it was decided to try virus isolation from blood samples taken as early as possible after the onset of the disease, but although more than 150 bloods were used, results obtained were entirely negative. The same blood samples were subjected to neutralization tests so that it might be determined if any might have neutralizing qualities either natural or as a result of a previous infection. None of the samples so tested reacted positively.

The plan was then to obtain as many second samples as possible from the same patients a few weeks after recovery that comparative tests be made, and of 102 such tests done 79 were found to be definitely capable of neutralizing the Western type of the equine virus.

The procedure adopted in attempting virus isolation was to inoculate guinea pigs and mice intracerebrally, and at the same time use as many eight-day chick embryos as possible for each sample. Mice were used that there might be no chance of the St. Louis virus being missed.

It should be mentioned here that the virus secured from the two brains already referred to was first obtained from guinea pig, although in each case fifty embryos and ten mice were inoculated with the same material. Although

in these cases guinea pig appeared most suitable for first isolation, we have previously secured virus from new material by the embryo method and failed with guinea pig inoculation. The number of embryos used, however, was always greatly in excess of the animals employed, and probably had some bearing on the results secured.

Cultivation

The two human strains obtained last year were rather difficult to establish in their new host, and until a number of transfers were made, only about half of the inoculated animals succumbed to infection. Virulence was quickly enhanced, however, by embryo passage, and little difficulty was experienced in keeping it alive when eggs were used.

Neutralization Tests

Both of the human viruses were introduced into a series of guinea pigs protected with equine encephalomyelitis vaccine of the Western type, and in all instances the vaccinated animals survived while controls showed typical symptoms of encephalomyelitis and died.

The new viruses were also subjected to neutralization tests using a potent antiserum produced by hyper-immunizing horses with known equine virus. Varying virus dilutions were brought in contact with an equal volume of antiserum and kept at icebox temperature over night, and a definite volume introduced into five eight-day embryos for each virus dilution. Guinea pigs and mice were also used and by this method it was definitely shown we were dealing with the Western equine virus.

Considering the possibility of a human outbreak occurring, it was thought advisable to have antiserum on hand for the treatment of developed cases, and horses were therefore hyper-immunized during the winter and spring months prior to the epidemic. These animals were first given chick-embryo vaccine which was followed with increasing doses of embryo virus given at first subcutaneously and later intravenously in doses of 50 cc. weekly. The antiserum was found capable of neutralizing *in vitro* virus with a titre of over one in ten million when dilutions as low as one in one hundred were used.

Considerable of this antiserum was used during the outbreak and in some cases one was inclined to the view that it was definitely of value because of the marked change for the better noted almost immediately after its administration. On the other hand, however, many patients receiving no such treatment just as suddenly showed signs of improvement.

Although we have found that this antiserum is capable of neutralizing highly virulent virus *in vitro*, very disappointing results have been secured when *in vivo* tests have been carried out. So far we have been unable to alter the course of the disease in experimental animals, even when comparatively large doses of serum have been given. This is quite contrary to the findings reported recently by other workers. It is true the tests to which the antiserum has been subjected are severe, since guinea pigs have been used and the virus introduced directly

into the brain tissue which is necessary because of the inconstancy with which one can produce the disease in these animals when any other route is made use of.

We find that although the antiserum is perhaps of little value in the treatment of the disease when the virus has localized in the brain, it undoubtedly has very definite immunizing qualities. Recently considerable work has been done along this line using fifteen-day-old mice and giving virus intraperitoneally. These animals are definitely protected if antiserum is given just prior to virus.

A detailed report on this and other work under way will be published in the near future.

A supply of vaccine for human use will be available this year in the event of another outbreak occurring if the physicians should desire to make use of it as a preventive measure.

Sequelae

We have endeavoured to obtain follow-up reports on all of the cases which recovered, but the results cannot be stated in this preliminary report as the work has not yet been completed. However, Dr. Urban Gareau, Regina, has supplied the following information:

Sixteen cases at onset were 6 months and under, the youngest being 10 days. Of these 1 was mild, 4 moderately severe, and 11 severe. Of the severe cases 9 recovered completely; 2 have not been heard from as to residuae; and 5 showed residuae, 2 of whom are definitely mentally deficient and 3 have varying degrees of rigidity and paralysis. One child died at one year.

The older group included 16 cases from 1 to 13 years, 3 of which were mild, 4 moderately severe, 8 severe and one fatal (no autopsy was performed). Of the 8 severe cases 5 recovered completely. The residuae in 1 case were uncertain and there was paralysis in 2 (paralysis of the leg in 1 case and weakness of the leg in the other case).

Out of the 33 cases, therefore, 2 died and 7 have shown varying degrees of residuae at a period of eight to ten months after onset. A few of these should show further recovery.

A more complete report will be available in the course of a couple of months.

To date, 42 doctors have sent into the Department reports on 131 cases. Much of the information on the questionnaire is of a negative nature.

As to present condition of patients, 69 are apparently normal. The following sequelae are noted:

Tires easily—3
Weak—6
Walk unsteady and jerky—6
Ataxic—1
Stilted—1
Left shoulder partially paralyzed—1
Spastic gait—1
Nystagmus—1
Neurasthenia—2
Slow thinking—3
Irritable—2
Hypersensitive—1
Sent to mental hospital—1
Sent to psychopathic hospital—1
Memory impaired, listless, dull, forgetful—7
Unable to converse—1
Gloomy and depressed—2
Speech slow—1
Cries easily—1
Increased nervousness—2
Confused—1
Restless—2
Childish—1
Exaggerated reflexes—1
Distortion of sensation—1
Choreic movements—1
Parkinsonian Syndrome—3
In a child 2 years old walking was retarded and the child was very nervous.
One case had a relapse.

Control

At the onset of the epidemic, encephalomyelitis was made a reportable disease and isolation of the patient only was required, as there was no evidence of contact being a factor in transmission of the disease. The schools were kept open upon the recommendation of the Department.

Further Investigations

The Department of Pensions and National Health very promptly provided assistance in the control of this epidemic by sending Dr. G. D. W. Cameron, Chief of the Laboratory of Hygiene, Dr. R. J. Gibbons, Chief of the Laboratory at Kamloops, Dr. A. E. Watson, Chief of the Veterinary Laboratory at Ottawa, Dr. Ronald Gwatkin, Chief of the Veterinary Pathological Laboratory at Lethbridge, and Dr. King, Chief of the Entomological Laboratory at Saskatoon, to advise regarding control measures and research for a vector of the virus, such as mosquitoes or biting flies, etc., and to ascertain if a virus reservoir could be determined.

Two field crews will operate this summer to carry on the work initiated at that time, with the Veterinary Pathological Laboratory at Lethbridge, under Dr. Gwatkin, and the Veterinary Pathological Laboratory of the University of Saskatchewan at Saskatoon, under Dr. J. S. Fulton, doing the laboratory work on the specimens which will be sent to them.

Printed Material in Health Education*

ITS STATUS IN THE PRESENT EMERGENCY

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THREE volumes formed the basis of the library in the average Victorian home—the Bible, a guide to motherhood, and a cook book with a section on home remedies. Within the limits of prevailing popular belief, the last two books provided our grandparents with reference material covering nutrition, certain aspects of preventive medicine, and antenatal and postpartum care. If, as was commonly the case, the rod was in frequent use in the home, then the field of mental hygiene of childhood also was adequately, if unknowingly, covered.

Eventually the primitive home medical advisers evolved into sound works, encyclopedic in character. More recently we have seen shorter treatises separately dealing with some particular health subject. That the latter type has not achieved a widespread sale, despite the modest price, is chiefly due to the availability of free literature, its liberal distribution, and more important still, a willingness on the part of the public to accept advice so offered as authoritative, irrespective of whether it is issued by government departments, voluntary health agencies, or commercial concerns of repute. Naturally, the health seeker's susceptibility to printer's ink has not always been an unmixed blessing. But when one considers the opportunities for taking advantage of literacy, divorced from an ability to discriminate, it is surprising how little harm to the public health has been accomplished through misinformation. Today, the great bulk of printed matter available for health education is accurate, ethical, and attractive, irrespective of its source.

Printed matter in health education can be classified roughly under two headings:

(a) The personal message.
(b) The impersonal.

The press is not included in these headings. Newspapers and magazines are highly specialized tools best fitted to perform a function which will be considered in its proper place.

The first type embraces all those printed messages which are transferred from the issuer to the personal ownership of the recipient. The common variants are the pamphlet, leaflet, and payroll envelope insert. Less commonly used, but deserving of much greater consideration, are short,

*Presented before the Public Health Education Section at the thirty-first annual meeting of the Canadian Public Health Association, held in Toronto, June 1-3, 1942.

pithy messages overprinted on or inserted in envelopes used in general correspondence or on bills sent out by corporations and public utility services.

The second group includes posters, display cards, and billboards. They are impersonal in the sense that the message is there to be shared by all who run and care to read.

Group A is immeasurably more effective than group B because the transfer creates a sense of individual ownership in the mind of the recipient. Consciously or unconsciously, the message conveyed becomes personal in its appeal. In terms of effectiveness, a plainly printed but well-written leaflet is superior to expensive display cards, billboards, or posters. The effectiveness of type B material, when used alone, does not justify its cost and it should only be considered as an auxiliary to type A.

All of us who are responsible for the production and distribution of free educational material in the health field face common problems—the necessity for economy in expenditure, and shortage of materials to the lavish use of which we have become accustomed. There is no reason to go into mourning. It is a good thing that existing and expected shortages in printed materials and labour are forcing us to think in terms of simplicity in production. The truth is that if we have something important to say and we write it well, print it in readable type, and give very careful thought to our channels of distribution, an economically produced message can achieve excellent results. Our basic problem can be rather inelegantly and ungrammatically stated in terms of "What do we want to say?" and "To whom?" In the past we have sometimes covered up sloppy handling of these essentials by dressing up printed matter like a spring seed-catalogue.

We might just as well face the fact that while it is possible to write in a manner understandable by all who can read, there are wide differences in reader reaction when we give the same printed material to everyone. Logically, we aim at the centre of the adult reading mass, but we fool ourselves if we think that a message so designed is also entirely suitable for children, and at the other end of the scale will completely satisfy the person of above average intelligence or education. That there used to be a very wide distribution to young school children, of literature obviously written for adults, is not proof that the material ever was suitable. Rather was it a curious reflection of defects in past methods of teaching health in our schools. It is equally true that the interest of readers of above average intelligence is not held by oversimplification in language or presentation. This type of citizen is worth catering to—first, because his personal health and the health of his family are just as important to the State as the health of the working-class population; second, because of the influence that people of this type and of both sexes can exert in the community, both as individuals and members of civic groups.

In printed matter designed for the adult masses it is desirable to omit technical details. It is sufficient to present clearly, concisely, and definitely, sound advice concerning protective measures, with the addition in the case of diseases of enough information about beginning symptoms to arouse sus-

picions in the mind of one observing an ailing person. The object of this is to encourage the calling in of competent medical advice. If too much information is given, there is danger that the text will be used for homemade diagnosis and treatment. However, the above-average reader will desire more than a bald statement that certain measures are recommended. The type of reader that we visualize has an intelligent curiosity as to the why and wherefore—and he is entitled to have his entirely reasonable demands satisfied. There are two possible solutions. One is for general literature to refer briefly in footnote form to suitable supplementary material when such is available. The other is to make the fullest possible use of the facilities so generously offered by the press for dealing with matters of interest to the public health through special articles in newspapers and magazines. Occasionally a health department or health agency is blessed by having on its staff that rare bird, the health worker who can write a news story, but in general it is sound practice to call in a skilled newspaper or magazine writer, give him accurate information, and let him write it up in a manner which he knows is best suited to the audience to which he is appealing. The marvel is, not that so much prepared health material sent to newspapers is consigned to the waste-paper basket, but that so many editors, in the kindness of their hearts, publish this dreary stuff even on the back pages.

Concerning distribution—today's need for economy calls for a cessation of wasteful methods of indiscriminate distribution in fair grounds, theatres, exhibits, and public gathering places. A widespread distribution to school children is only justified in connection with a specific message tied in with a definite campaign affecting the age groupings to which the children belong. Printed matter written for adults should be made available to school teachers for the teacher's use only, and not for classroom distribution. Printed matter on one specific subject can be distributed at or after a small meeting held for the purpose of studying that particular subject. Personal distribution by physicians, dentists, nurses, and social workers at offices and clinics is excellent, but not the 'help yourself' system so often seen in offices, or clinic anterooms. The most effective method of distributing printed matter in health education is by person-to-person delivery in the home. The value of this type of distribution is increased a hundredfold, if, in the case of non-professional distributors, the person delivering the literature has first received instruction in what the literature is all about so that he can emphasize the value of the message he is delivering. With our expanded war industries, there are 900,000 more people employed today than there were in 1939—we should make more use of payroll inserts as a medium for distributing printed matter in health education, and we should use house organs and trade union papers to supplement the information so distributed.

We must keep in mind the need for economy in spending. We can do without expensive papers, colour work, and costly illustrations. In most cases we can dispense with cover stock and start our message under a large type title on the first page and carry the letter press over on to the back sheet. If covers are desirable, it is questionable whether we are justified in setting

up separate cover designs for separate pamphlets. We should seriously consider whether one plain uniform cover could not be used for a whole series of pamphlets. It would be worthwhile to canvass the field of cooperative printing. A successful example of this was the manner in which a group of life insurance companies banded together to make possible the printing of over two million copies of "Food for Health in Peace and War."

SUMMARY

Despite advances made in other techniques, the printed word still is the most important medium for health education.

Informative material placed in the hands of the individual is more effective than the impersonal message placed before the public at large by means of billboards, posters, or display cards.

Newspapers and magazines are the best media for the presentation of material supplementary to what conveniently can be included in a brief, simply printed message designed for the average reader.

Shortage of material and labour in the printing trades, plus the need for economy in expenditure, makes it necessary to strip our production methods of all non-essentials. This can be done. In addition, we can stop waste through careful attention to distribution methods and by pooling resources both in production and distribution of printed matter.

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FULL-TIME LOCAL HEALTH SERVICES IN CANADA

AN analysis of the data obtained by the Committee on Full-Time Local Health Services is published in this issue as part of the report of the Association's work during 1941-42. The findings have particular value in that they constitute a record of conditions just prior to the war. A similar survey being undertaken for the year 1941 will provide pertinent information in regard to the effect of the war upon local health services. The study was undertaken at the request of the Dominion Council of Health for the purpose of obtaining as much information as possible concerning full-time local health services, including the expenditures for all health services. Information was obtained concerning the personnel employed and the public health qualifications of those serving. An outline of the organization of each local health department was sought, together with information concerning milk control, the extent of immunization, and a summary of pertinent vital statistics. The response from the medical officers of health, municipal treasurers, local departments of education, and hospital boards was most gratifying.

The study shows that in 1938 there were eighty-five communities in Canada, representing 50 per cent of the total estimated population, which were served by a full-time medical officer of health. A recent survey in the United States revealed that in June 1941 the combined population of the 1,669 counties and 103 cities with full-time service represented approximately 70 per cent of the total population of the forty-eight States and the District of Columbia.

Of the eighty-five communities, twenty-eight were considered urban, 46 rural, and eleven as serving both urban and rural populations. Although the number of rural municipalities greatly exceeds the number of urban municipalities, the population served in British Columbia, Alberta, Manitoba, and Ontario was predominantly urban. The eighty-five communities included cities, towns, county health units, and districts.

The communities were served by 332 physicians, 187 of whom were devoting their full time to public health work; 620 nurses, of whom 613 were serving full-time; 538 sanitary inspectors, 424 full-time; and 96 dentists, 28 full-time. Of the physicians serving full-time, 105 (approximately 60 per cent) had post-graduate training in public health, usually possessing the Diploma in Public

Health. Thirty-seven per cent of the nurses had a public health qualification and 80 per cent of the sanitary inspectors possessed an acceptable certificate. These data indicate the excellent progress that has been made in the training of public health personnel.

Recognition of the advantages of unified health direction in local communities is evidenced by the finding that school medical inspection services are under the direction of the health department in all but fourteen of the eighty-five communities.

Pasteurization of the entire milk supply was recorded in only fourteen of the eighty-five local health departments reviewed in the survey, and thirteen of these were in Ontario. Subsequent surveys will show extension of pasteurization since this measure is now required throughout the Province of Ontario for all milk offered for sale. The findings indicate the necessity of intensifying the educational efforts directed towards the safeguarding of milk supplies through adequate inspection and pasteurization.

The survey was planned primarily to obtain as much information as possible concerning local health expenditures. It is a common error to attempt to compare health expenditures of different municipalities. Even a superficial examination of the Committee's report reveals the complexity of these expenditures. Local health services are maintained from the funds provided by the municipality directly to the health department, by provincial grants, and by voluntary agencies. In addition, health services may be paid for by departments of the local government other than the health department, and provincial assistance may be given in providing medical relief and payments for hospitalization. The Committee has wisely refrained from attempting to present any per caput expenditures.

The survey shows that for these eighty-five communities a total of $11,638,401 was expended in 1938. Of this amount approximately one-third was provided for the services of the department of health by the local municipality. Almost two-thirds was expended for medical relief and hospitalization. These expenditures by local municipalities are a counterpart of the expenditures by Provincial Departments of Health. In a study of provincial expenditures in 1937 it was found that the expenditures for hospitalization, including sanatorium care, amounted to 84 per cent of the total budget, leaving only 16 per cent for the other activities of the Provincial Health Department. The urgent need is for the widening of preventive services in every part of Canada. The disproportionate cost of treatment as revealed by these studies indicates the urgency for the strengthening of preventive services. It is earnestly hoped that the Federal Government will assist the Provinces in forwarding the application of preventive medicine, through grants-in-aid. Such action would place the Provincial Departments in a position to aid more adequately the local municipalities in their health services. For many communities, the formation of combined health areas or county-wide organizations is recognized as the means of providing adequate full-time health services. Grants-in-aid from the Federal Government to Provincial Departments of Health would advance greatly the whole public health program in Canada, and particularly full-time health services.

THE ASSOCIATION'S WORK DURING 1941-42

(Part II)

REPORT OF THE COMMITTEE ON FULL-TIME LOCAL HEALTH SERVICES

IN 1939 this Committee was formed for the purpose of obtaining information concerning the extent of full-time health services in Canada. It was hoped that information, particularly that relating to expenditures, would be obtained as a step towards the obtaining of similar information for all local health departments. When it is remembered that in Ontario, for example, there are more than seven hundred local health departments and only 14 are served by full-time medical officers of health, and that in five other provinces the great majority of health officers serve on a part-time basis, a real difficulty presents itself in obtaining satisfactory information concerning the extent of local health services and expenditures. For that reason, the Committee considered that the first step should be a study of local health services in communities employing a medical officer of health on a full-time basis. Information as to the number of such local health services was lacking and no data were available as to the extent of expenditures in the group as a whole.

Because of the nature and extent of the undertaking, the Committee sought the co-operation of the Department of Epidemiology in the School of Hygiene, University of Toronto, and the Department agreed to carry forward for the Committee the survey and to tabulate the reports. The Committee plans to conduct a similar survey for the year 1941 and it is felt that if such surveys may be made at regular intervals the progress of full-time health services in Canada may be properly recorded.

R. D. DEFRIES, *Chairman.*

FULL-TIME LOCAL HEALTH SERVICES IN CANADA IN 1938

(LOCAL SERVICES WITH FULL-TIME MEDICAL OFFICER OF HEALTH)

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IT IS clearly recognized that in so far as the provision of adequate public health services is concerned ways and means must be found whereby the federal government may make to the provincial governments grants-in-aid for public health purposes. An impetus has been given to this by the demonstration in the United States of what is possible through federal financial assistance to state departments for public health work. Any fear that such federal assistance would tend to decrease state and local appropriations has been completely dispelled: fiscal reports of state and local departments

GENERAL DATA

Population (assessed).....

Area in square miles.....

DEPARTMENTAL PERSONNEL WITH QUALIFICATIONS

Kindly fill in the personnel of your department of health by use of the table below. Indicate, where possible, those with special qualifications in public health work.

Personnel	Full-Time		Part-Time	
	Total Number	No. with degree or diploma in public health	Total Number	No. with degree or diploma in public health
PHYSICIANS AND DENTISTS:				
Medical Officer of Health				
Deputy Medical Officer				
School Medical Physicians				
School Dentists				
Child Hygiene Physicians				
Venereal Disease Physicians				
Mental Hygiene Physicians				
Tuberculosis Physicians				
Epidemiologist				
Laboratory Director				
PUBLIC HEALTH NURSES:				
Director				
Supervisors				
Nurses				
SANITARY INSPECTORS:				
Chief Inspector				
Chiefs of Milk, Food, Housing, Plumbing Divisions, etc.				
Sanitary Inspectors				
CLERICAL STAFF:				
Statistician				
Secretary				
Clerks				
OTHER PERSONNEL:				
Ambulance Drivers				

indicate that as a result of the stimulus of federal assistance many millions of dollars of additional funds have been made available by these authorities.

In Canada, there is a need for the compilation of essential data regarding public health expenditures by provincial governments and by local authorities. A compilation of provincial expenditures for public health was made in 1939 by a Subcommittee of the Dominion Council of Health, relating to the year 1937. This study showed that a total of $21,719,826 was expended in that year by the provincial departments in the interests of public health. Of this amount, 44 per cent was spent in the support of mental hospitals, 27 per cent for public hospitals, 13 per cent for tuberculosis sanatoria, and only 16 per cent for the activities of provincial health departments. Analyses of the expenditures revealed that 91 per cent of the total amount expended was for the provision of treatment and only 9 per cent for preventive services. According to the British North America Act, the care of the sick is a provincial responsibility. The cost of treatment in all its forms for physical or mental illness is therefore a provincial charge. The amount of money left to provincial departments of health for programs of disease prevention is entirely inadequate, being less than 10 per cent of the total expenditures for so-called public health purposes. Study of the provincial expenditures shows clearly that the cost of caring for tuberculosis patients equals the total of all the other expenditures of provincial health departments, with the result that in some provinces serious curtailment of activities in preventive medicine is in evidence.

In considering the whole question of health expenditures in Canada the question arises as to the amount of the expenditures for public health which are being made by local health departments. It was felt that if such information could be obtained and the amount added to the total provincial expenditures, valuable data would be made available for the support of the case for federal assistance to the provinces for public health work. It was found impossible to obtain adequate information concerning local public health expenditures from public health reports of local departments of health or from provincial departments of health. The Canadian Public Health Association was asked by the Dominion Council of Health in 1939 to appoint a committee to conduct a study for the purpose of obtaining as much information as possible concerning full-time local health services. The Committee found that it would be practical only to obtain satisfactory information from departments of health having a full-time medical officer of health. No figures were available at that time as to the number of such departments in Canada. It was felt also that information should be obtained as to the extent of the personnel employed and the public health qualifications of those employed. An outline of each local health department was sought and information concerning the control of milk, including pasteurization, also formed part of the questionnaire. Data concerning the extent of immunization and a summary of pertinent vital statistics were requested. An attempt was made to obtain an analysis of expenditures in a form which would permit their proper classification. Two of the five pages of the questionnaire form, those relating to personnel and expenditures, are shown on pages 406 and 408. The other pages, presenting the divisions of the department, the vital statistics report,

TOTAL EXPENDITURES FOR PUBLIC HEALTH IN THE MUNICIPALITY OF ..... YEAR .....

Analysis of Expenditure by Division or Service	Number Employed	Provided in Department of Health Budget			Paid by other Depts. of Municipality	Provided by grants from Provincial Government, Voluntary Agencies, etc.		Total Expenditure for all Health Services
		Salaries	Maintenance (travel, upkeep, rents)	Total Expenditure by Dept. of Health		Prov. Govt.	Vol. Ag.	
1. Administration								
Medical Officer of Health								
Deputy M.O.H.								
Medical Assistants:								
(a) School Medical Physicians								
(b) School Dentists								
(c) Child Hygiene Physicians								
(d) Venereal Disease Physicians								
(e) Mental Hygiene Physicians								
(f) Tuberculosis Physicians								
(g) Epidemiologist or Director of Communicable Disease Control								
(h) Laboratory Director								
Secretary								
Clerical staff								
2. Public Health Nursing								
Director								
Supervisors								
Nurses								
Clerical staff								
3. Vital Statistics								
Clerk								
If no special division, indicate if included under administration.								
4. Communicable Disease Control								
Maintenance of isolation hospital								
Ambulance service								
Immunization programs								
Quarantine costs, fumigation, etc. (Salaries of inspectors under item No. 8)								
5. Tuberculosis Control								
Sanatorium care, preventorium, etc.								
Social service								
Cost of clinics								
Surveys—testing; transportation, rehabilitation, etc.								
6. Venereal Disease Control								
Clerk								
Social service worker								
Cost of clinics								
7. Mental Hygiene								
Supervising Nurse								
Clerical staff								
8. Environmental Sanitation								
Milk control—inspectors								
Food control—inspectors								
Quarantine—inspectors								
Sanitation—inspectors								
Clerks								
9. Laboratory Service								
Technical assistants and clerks								
Bacteriological control of water supplies if paid by Department								
10. Public Health Education								
Distribution of literature, moving pictures, radio talks, etc.								
11. Other Special Programs not Listed Above. Specify								
12. Money paid by the Municipal Government to Voluntary Agencies for Medical, Dental and Nursing Care, such as Victorian Order of Nurses, Canadian Red Cross Society, etc.	X	X	X			X	X	
TOTAL FOR FUNDAMENTAL HEALTH ACTIVITIES INCLUDING ISOLATION HOSPITAL COSTS		X	X					
Money paid by the Municipal Government for Medical Care of Indigents, Medical Relief, Grants to General and other Hospitals.		X	X				X	
TOTAL OF THESE PUBLIC HEALTH EXPENDITURES IN THE MUNICIPALITY								

and milk control, are not reproduced. It was soon realized that although the most careful thought had been given to the preparation of the questionnaire and trial of it had been made in a number of municipalities, the separation of the various constituent expenditures for health, hospital and welfare services was most difficult owing to the complexity of many local situations. In few municipalities can the desired information be obtained from the Department of Health. The Board of Education, the Hospital Board, the Department of Welfare, or the Municipal Treasurer must frequently be consulted and often incomplete or inadequate information is obtained. For this reason the data are presented as received, without an attempted analysis according to divisions or services. The report is presented under the headings of Personnel, Services, Vital Statistics, Milk Control, and Health Expenditures. Although the Committee has not been able to accomplish all that it desired, it is believed that the data collected do give a fairly satisfactory picture of full-time local health services prior to the war.

In considering the sending of a questionnaire, the Committee decided that only one form should be utilized and realized that small local departments would consider the questionnaire somewhat unsuitable. The experience of the Committee was, on the whole, quite gratifying in this respect.

MUNICIPALITIES HAVING A FULL-TIME MEDICAL OFFICER OF HEALTH, 1938

Table I presents the communities which were included in this study as having a full-time medical officer of health, together with the populations as furnished by the medical officer. These communities number 85, with a total population of 5,589,316, or 50 per cent of the total estimated population of Canada. The data are presented as urban and rural, and in the instance of Prince Edward Island and New Brunswick, as serving both rural and urban communities.

PERSONNEL

As defined, the term "full-time local health services" relates to communities where a medical officer of health is employed on a full-time basis. The expression "full-time local health services" is obviously unsatisfactory as it implies more than is intended. In Saskatchewan and in Manitoba, a considerable number of municipalities are provided with the services of a medical officer on a full-time basis through the employment of physicians on a full-time basis as municipal physicians providing medical care and serving as medical officer of health. In making the tabulations, it was felt that it would be best to omit from the totals the municipal physicians serving as full-time medical officers of health in view of the incomplete information which was available. Notation, however, has been made in the appropriate tables to indicate the extent of these services.

A summary of full-time local health services in Canada for 1938, by provinces, is presented in table II. A total of 85 local health services, whether city, town, rural municipality or county health unit, were reported in the survey. Of this number, 28 were considered urban, 46 rural, and 11 both urban and rural. These departments served 50 per cent of the total popu-

lation of Canada. In New Brunswick, the province is divided into ten health districts, and health services for cities of Saint John, Fredericton, Moncton, Woodstock and other urban centres are included in the district organizations. In Prince Edward Island, the city of Charlottetown is served through the provincial health organization. No division of population into urban and rural has been made for these two provinces. Eleven local departments in New Brunswick and Prince Edward Island are therefore considered as serving both rural and urban areas for the purpose of this study.

One of the purposes of the study has been to learn the total number of physicians, nurses, dentists, and sanitary inspectors employed in these departments having a full-time medical officer of health. In table II, a summary of the distribution of personnel by provinces is presented. Information was sought concerning the public health qualification of each group. In the case of physicians, special qualification in public health in the form of a degree in public health or a diploma was considered as an adequate public health qualification. Similarly for nurses a degree in public health nursing or training leading to a certificate or diploma in public health nursing, and in the instance of sanitary inspectors the holding of a certificate from the Conjoint Examining Board in Great Britain or of the Canadian Public Health Association in Canada or other qualifying certificate was considered a suitable qualification.

In many local health departments, practising physicians may serve on a part-time basis in connection with the conduct of venereal disease clinics, tuberculosis clinics, well-baby clinics, and immunization centres. This is true also in regard to veterinarians serving as part-time food inspectors. Only a small number of public health nurses are employed part-time. In table III a summary for the whole of Canada is presented showing also the public health qualifications of each group. It is of interest to note, in table IV, that 187 physicians were serving in full-time capacity, the great majority as medical officers of health, and of this number 105 possessed a public health qualification. There were 613 public health nurses, of whom 227 had a public health qualification, and 424 sanitary inspectors, of whom 118 had a certificate. In addition, there were 28 dentists serving on a full-time basis, making a total of 1,252 members of these groups serving full-time. On a part-time basis, the table records 334 persons, making a total staff, excluding clerical, of 1,586. It will be remembered that the total number of municipalities recorded as having a full-time medical officer in this study is 85. For convenience, the data concerning personnel are presented for each province in table V as urban and rural and in table VI as serving full-time or part-time.

ORGANIZATION OF SERVICES

The effort was made through the use of a diagram to obtain a picture of the organization of the local health services. In larger departments where the personnel is numerous and the departments organized into divisions, presentation of the activities is readily made, in contrast to small departments where the medical officer of health personally is responsible for the various functions

TABLE I

URBAN AND RURAL LOCAL HEALTH SERVICES—1938

Province	Urban	Population	Rural	Population
British Columbia	Great'r Vancouver (Met. Area)	315,562	Saanich Full Time Health Unit	16,000
	Victoria	39,261	Kelowna Full Time Health Unit	10,882
			Fraser Valley Full Time Health Unit	8,000
			Peace River Full Time Health Unit	7,600
Alberta	Calgary	85,726	Foothills Health Unit	16,000
	Edmonton	88,887	Red Deer Health Unit	19,131
Saskatchewan	Regina	53,464	*	
	Saskatoon	42,038		
Manitoba	Winnipeg	222,454	St. James-St. Vital	24,268
	Brandon	17,382	†	
	St. Boniface	16,450		
Ontario	Toronto	649,123	Eastern Health Unit	93,200
	Hamilton	155,376		
	Ottawa	144,202		
	Windsor	109,107		
	London	76,138		
	Brantford	31,497		
	Ft. William	25,050		
	Kingston	24,900		
	Peterborough	24,146		
	Kirkland Lake	21,934		
	Kitchener	33,309		
	East York	38,132		
	York Township	75,776		
Nova Scotia	Halifax	70,000	Cape Breton Island Health Unit	133,000

Province	Urban	Population	Rural	Population	Rural	Population
Quebec	Montreal	893,000	Abitibi	37,696	Magdalen Isle	8,856
	Quebec	147,000	Argenteuil	20,103	Maskinonge	17,150
	Lachine	19,656	Arthabaska	28,426	Matane	21,960
	Three Rivers	41,300	L'Assomption-Montcalm	30,690	Matapedia	28,300
	Hull	30,738	Beauce	46,796	Megantic	38,122
			Bonaventure	37,050	Nicolet	28,953
			Brome-Missiquoi	32,495	Papineau	30,820
			Champlain	31,234	Rimouski	39,832
			Chateauguay-Huntingdon	23,900	Riv. du Loup & Temiscouata	58,957
			Chicoutimi	71,232	Roberval & Lac St. Jean	64,573
			Compton	21,120	St. Hyacinthe & Rouville	41,940
			Drummond	31,460	St. Jean-Iberville	
			Gaspé, East	25,000	Laprairie-Napierville	51,720
			Gaspé, North	11,610	St. Maurice	33,850
			Joliette	29,931	Shefford	30,967
			Kamouraska-L'Islet	45,530	Temiska-mingue	35,000
			Labelle	20,872	Terrebonne	42,690
			Laviolette	30,093	Wolfe	17,189
			Levis	37,690		
			Lotbiniere	26,820		

Serving both Rural and Urban

New Brunswick	Albert and Westmorland	71,013	Restigouche	36,634
	Fredericton-York-Sunbury	42,413	Carleton-Victoria	38,941
	Gloucester	46,531	St. John Charlotte	88,000
	Kings and Queens	34,308	Kent	24,000
	Northumberland	36,047	Madawaska	28,900
P.E.I.	Serving both Rural and Urban			94,000

*In addition, the services of full-time medical officers of health through Municipal Physicians in 66 municipalities.

†12 municipalities.

TABLE II—FULL-TIME† LOCAL HEALTH SERVICES IN CANADA 1938 BY PROVINCES

Province	Population Estimated	Full-Time Departments			Population Served			Percent of Total Population		
		Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
British Columbia	761,000	6	2	4	397,305	354,823	42,482	52.0	46.5	5.5
Alberta	783,000	4	2	2	209,744	174,613	35,131	26.7	22.2	4.5
Saskatchewan	941,000	2*	2	0	95,502	95,502	.....	10.1	10.1	....
Manitoba	720,000	4*	3	1	280,554	256,286	24,268	38.9	35.5	3.4
Ontario	3,731,000	14	13	1	1,501,890	1,408,690	93,200	40.2	37.8	2.4
Quebec	3,172,000	42	5	37	2,362,321	1,131,694	1,230,627	74.6	35.8	38.8
New Brunswick	445,000	10	..	..	445,000	.....	.....	100.0	....	....
Nova Scotia	548,000	2	1	1	203,000	70,000	133,000	37.0	12.8	24.2
Prince Edward Island	94,000	1	..	..	94,000	.....	.....	100.0	....	....
CANADA	11,195,000	85	..	..	5,589,316	.....	.....	50.0	...	....

†Full-Time Medical Officer of Health.
*Excluding Municipal Physicians.

TABLE III—FULL-TIME LOCAL HEALTH SERVICES IN CANADA 1938
Distribution of Personnel

Province	Number of Departments	Physicians		Nurses		Sanitary Inspectors		Dentists	TOTAL	
		No.	*With Public Health Qualification	No.	*With Public Health Qualification	No.	*With Public Health Qualification	No.	No.	*With Public Health Qualification
British Columbia	6	25	16	68	57	22	17	8	123	90
Alberta	4	8	3	19	3	17	8	4	48	14
Saskatchewan	2	6	2	12	1	13	5	3	34	8
Manitoba	4	9	5	22	0	26	22	0	57	27
Ontario	14	112	13	216	109	130	32	60	518	154
Quebec	42	125	53	249	39	150	31	10	534	123
New Brunswick	10	21	12	14	6	169	0	6	210	18
Nova Scotia	2	22	2	15	11	8	0	3	48	13
Prince Edward Island	1	4	2	5	4	3	3	2	14	9
CANADA	85	332	108	620	230	538	118	96	1,586	456

*Qualification—Degree, Diploma, or Certificate.

TABLE IV

DISTRIBUTION OF PERSONNEL—FULL-TIME AND PART-TIME

Employed	Physicians		Nurses		San. Inspec.		Dentists	Total
	No.	With P.H. qualifications	No.	With P.H. qualifications	No.	With P.H. qualifications	No.	No.
Full-Time..	187	105	613	227	424	118	28	1,252
Part-Time..	145	3	7	3	114	0	68	334
Total....	332	108	620	230	538	118	96	1,586

TABLE V

URBAN AND RURAL DISTRIBUTION OF PERSONNEL

Prov.		No. of Depts.	Population Served	Per cent of Total Pop'l't'n	Physicians		Nurses		Sanitary Inspectors		Dentists	Total No.
					No.	With Qual.	No.	With Qual.	No.	With Qual.	No.	
B.C.	Urban	2	354,823	46.5	16	13	51	45	20	16	5	92
	Rural	4	42,482	5.5	9	3	17	12	2	1	3	31
	Total	6	397,305	52.0	25	16	68	57	22	17	8	123
Alta.	Urban	2	174,613	22.2	6	2	15	0	16	8	4	41
	Rural	2	35,131	4.5	2	1	4	3	1	0	0	7
	Total	4	209,744	26.7	8	3	19	3	17	8	4	48
Sask.	Urban	2	95,502	10.1	6	2	12	1	13	5	3	34
	Rural	..	.....	....	...	..	...	..	...	..	..	...
	Total	2	95,502	10.1	6	2	12	1	13	5	3	34
Man.	Urban	3	256,286	35.5	8	4	20	0	24	22	0	52
	Rural	1	24,268	3.4	1	1	2	0	2	0	0	5
	Total	4	280,554	38.9	9	5	22	0	26	22	0	57
Ont.	Urban	13	1,408,690	37.8	111	12	207	109	102	32	60	480
	Rural	1	93,200	2.4	1	1	9	0	28	0	0	38
	Total	14	1,501,890	40.2	112	13	216	109	130	32	60	518
Que.	Urban	5	1,131,694	35.8	60	12	132	17	113	23	9	314
	Rural	37	1,230,627	38.8	65	41	117	22	37	8	1	220
	Total	42	2,362,321	74.6	125	53	249	39	150	31	10	534
N.B.	Urban	..	445,000	100.0	21	12	14	6	169	0	6	210
	Rural	..	.....	....	...	..	...	..	...	..	..	...
	Total	..	445,000	100.0	21	12	14	6	169	0	6	210
N.S.	Urban	1	70,000	12.8	6	1	4	0	8	0	3	21
	Rural	1	133,000	24.2	16	1	11	11	0	0	0	27
	Total	2	203,000	37.0	22	2	15	11	8	0	3	48
P.E.I.	Total	..	94,000	100.0	4	4	4	4	3	3	2	13

*Qualification—Degree, Diploma, or Certificate.

of the department. No attempt therefore was made to analyse the services of local health departments.

In connection with school medical inspection, practically all the departments indicated the provision of this service. Of the 85 departments included

TABLE VI

FULL-TIME AND PART-TIME DISTRIBUTION OF PERSONNEL

Province	Population Served	Employed	Physicians		Nurses		Sanitary Inspectors		Dentists	Total No.
			No.	With Qual.	No.	With Qual.	No.	With Qual.	No.	
British Columbia	397,305	Full-time	19	15	66	57	21	17	2	108
		Part-time	6	1	2	0	1	0	6	15
		Total....	25	16	68	57	22	17	8	123
Alberta	209,744	Full-time	5	3	19	3	16	8	0	40
		Part-time	3	0	0	0	1	0	4	8
		Total....	8	3	19	3	17	8	4	48
Saskatchewan	941,000	Full-time	4	2	12	1	13	5	3	32
		Part-time	2	0	0	0	0	0	0	2
		Total....	6	2	12	1	13	5	3	34
Manitoba	280,554	Full-time	5	5	22	0	25	22	0	52
		Part-time	4	0	0	0	1	0	0	5
		Total....	9	5	22	0	26	22	0	57
Ontario	1,501,890	Full-time	40	13	214	109	129	32	15	398
		Part-time	72	0	2	0	1	0	45	120
		Total....	112	13	216	109	130	32	60	518
Quebec	2,362,321	Full-time	95	52	246	36	150	31	8	499
		Part-time	30	1	3	3	0	0	2	35
		Total....	125	53	249	39	150	31	10	534
New Brunswick	445,000	Full-time	13	11	14	6	59	0	0	86
		Part-time	8	1	0	0	110	0	6	124
		Total....	21	12	14	6	169	0	6	210
Nova Scotia	203,000	Full-time	4	2	15	11	8	0	0	27
		Part-time	18	0	0	0	0	0	3	21
		Total....	22	2	15	11	8	0	3	48
Prince Edward Island	94,000	Full-time	2	2	4	4	3	3	0	9
		Part-time	2	2	0	0	0	0	2	4
		Total....	4	4	4	4	3	3	2	13

in this study, 68 stated that it was a responsibility of the department of health and 14 that of the board of education. In table VII data are presented showing the distribution of school medical services by provinces.

In table VIII, data relating to public health nurses are presented. A total of 620 nurses were recorded as serving in these departments, of which number

13 were directors and 36 supervisors. Of the 620 public health nurses, it was recorded that 230 had public health qualifications, either a university degree or post-graduate or other course in public health nursing. It is appreciated that this figure does not represent the total number of public health nurses serving in these departments. It does not include those serving in the Victorian Order of Nurses (except in New Brunswick), the St. Elizabeth Visiting Nurses, or other visiting-nurse organizations. It does not include public health nurses serving in industry or provided through the Metropolitan Life Insurance Company or other agencies. It should be remembered also that public health nurses who are attached primarily to provincial departments of health are not included.

TABLE VII

SCHOOL MEDICAL INSPECTION

Province	No. of Depts.	Responsibility		
		Health Dept.	School Board	Not Stated
British Columbia	6	3	3	–
Alberta	4	3	1	–
Saskatchewan	2	1	1	–
Manitoba	4	3	1	–
Ontario	14	8	6	–
Quebec	42	38	1	3
New Brunswick	10	10	–	–
Nova Scotia	2	1	1	–
Prince Edward Island	1	1	–	–
Canada	85	68	14	3

VITAL STATISTICS

In planning the questionnaire it was felt expedient to ask the minimum amount of information. This is particularly evident in the report relating to vital statistics. It was suggested that if detailed information was available in the annual report of the department, the supplying of data in this section could be omitted. Unfortunately, reports were not submitted by all the departments concerned and complete information therefore was not available to the Committee. If the questionnaire had been answered, it would have been possible to publish birth and death rates and infant mortality according to place of residence instead of place of occurrence. As a great many departments did not specify the number of non-residents, table IX records the total birth and death rates including non-residents, and the infant mortality rate also includes non-residents. In those municipalities in which the rates were calculated excluding non-residents, the resident rates are also given, printed in italics. These data are presented for each province, including both urban and rural departments.

MILK CONTROL

Although the inspection of dairy farms, the licensing of the sale of milk, inspection of dairy plants and particularly the value of pasteurization in safeguarding municipal milk supplies are recognized by all public health workers,

yet surveys of the extent of pasteurization in Canada have shown that much remains to be done. In the report of the Milk Committee of this Association published last year as relating to milk control in cities and towns in Canada for the year 1939, including all municipalities having a population of 2,000 or more, numbering 249, only 7 municipalities outside Ontario required compulsory pasteurization and only 50 municipalities outside Ontario had 50 per cent or more of the milk supply pasteurized. The provision of province-wide pasteurization in Ontario in 1938 constituted one of the greatest advances in the sanitary control of milk in Canada. The experience to date in that province has demonstrated that such a measure is practical and the most effective method for obtaining the adequate safeguarding of public milk supplies.

TABLE VIII
NURSES

Province	Total		Directors		Supervisors		Nurses	
	No.	With P.H. qualifications	No.	With P.H. qualifications	No.	With P.H. qualifications	No.	With P.H. qualifications
British Columbia	68	57	1	1	10	10	57	46
Alberta	19	3	...	..	...	..	19	3
Saskatchewan	12	1	1	0	2	0	9	1
Manitoba	22	0	...	..	...	..	22	0
Ontario	216	109	7	6	17	4	192	99
Quebec	249	39	1	1	6	3	242	35
New Brunswick*	14	6	1	0	1	0	12	6
Nova Scotia	15	11	1	0	...	..	14	11
Prince Edward Is.	5	4	1	1	...	..	4	3
Total	620	230	13	9	36	17	571	204

*With the exception of New Brunswick, visiting nurses (the Victorian Order of Nurses, St. Elizabeth Visiting Nurses) are not included in this report.

Of the 85 local health departments reviewed in this survey, pasteurization of the entire milk supply was recorded in only 14 and of this number 13 were in Ontario. The remaining department was Saskatoon, Sask. Twenty-six urban municipalities and 46 rural municipalities recorded inspection of dairy farms and 27 urban and 48 rural municipalities the inspection of dairy plants. In the 28 urban departments, there were 339 pasteurization plants and in the 57 rural departments 98 pasteurization plants. The urban communities had 711 raw milk plants and the rural communities 547. In New Brunswick, 781 additional distributors of raw milk were recorded. These data are presented in table X.

From the information supplied as to the extent of pasteurization, table XI has been compiled. In 14 of the 28 urban communities, pasteurization of milk is compulsory; in 23, 75 per cent or more of the milk is pasteurized; and in 28, 50 per cent or more. It is therefore evident that in all of the urban municipalities having full-time medical officers of health, 50 per cent or more of the milk is pasteurized. In contrast, of the 56 rural communities only 10 have recorded 50 per cent or more of the milk pasteurized. It is also recorded that 20 rural areas having a full-time medical officer of health have no pasteurized milk.

TABLE IX

VITAL STATISTICS

Province	Full-Time Health Service	Birth Rate	Death Rate	Infant Mortality Rate
British Columbia	Fraser Valley	16.5	5.2	38.1
		16.0	*4.6*	*23.4*
	Kelowna	25.8	5.8	22.9
	Peace River	27.4	4.2	24.0
		25.0	*3.9*	*26.3*
	Saanich	0.2	2.3	0
	Vancouver City	16.3	10.6	31.7
		13.4	*9.9*	*46.7*
	*Victoria	21.1	18.5	29.1
		10.9	*13.2*	*39.9*
Alberta	Calgary	19.2	9.4	27.9
		13.9	*7.5*	*30.2*
	Edmonton	31.0	14.4	36.7
		18.0	*8.0*	*39.3*
	Foothills	*18.1*	*6.0*	*31.1*
	Red Deer	*20.5*	*7.6*	*30.8*
Saskatchewan	Regina	26.2	10.5	46.5
		17.3	*6.2*	*45.5*
	Saskatoon	21.4	11.6	40.0
		12.4	*6.2*	*46.1*
Manitoba	Brandon	14.3	14.1	88.7
		10.2	*6.9*	*89.3*
	St. Boniface	80.9	35.6	39.8
		13.9	*5.9*	*34.7*
	St. James and St. Vital	11.8	7.1	3.6
		11.0	*3.3*	*3.7*
	*Winnipeg	16.8	8.5	41.3
		12.3	*7.2*	*40.6*
Ontario	Brantford	18.2	13.0	55.6
		14.3	*11.4*	*51.0*
	Ft. William	22.3	9.5	44.6
		16.1	*7.3*	*47.0*
	Hamilton	19.5	11.2	35.3
		16.4	*9.3*	*33.7*
	Kingston	30.8	20.9	57.4
		19.1	*13.0*	*56.8*
	Kirkland Lake	33.6	6.0	55.6
		31.0	*6.0*	*56.9*
	Kitchener	24.0	11.9	58.6
		17.1	*8.4*	*51.2*
	*London	20.8	14.5	45.3
	Ottawa	21.5	12.0	66.4
		18.1	*9.5*	*58.6*
	*Peterboro	28.9	15.1	44.2
	Toronto	16.3	10.8	51.1
		13.4	*9.9*	*46.7*
	*Windsor	21.3	8.4	35.5
	York Township	7.8	5.6	30.8
		7.2	*4.0*	*29.1*
	*East York	9.4	4.3	19.1
	*Eastern Health Unit	19.2	8.3	68.0
Quebec	Hull	26.6	10.8	97.8
	Lachine	19.8	9.2	48.8
		18.8	*4.8*	*48.8*
	Montreal	19.1	10.2	77.4

*Figures from Annual Report.
Figures in italics are resident rates.

TABLE IX—*Continued*

Province	Full-Time Health Service	Birth Rate	Death Rate	Infant Mortality Rate
Quebec—*continued*	Quebec	26.3	13.9	122.0
		25.2	*11.9*	*120.8*
	*Three Rivers	29.2	11.2	165.8
	Abitibi	40.4	10.1	85.9
	Argenteuil	20.4	10.6	75.4
	Arthabaska	27.8	10.2	89.8
	L'Assomption-Montcalm	23.9	7.2	59.9
	Beauce	31.6	9.6	77.0
	Bonaventure	28.0	8.4	99.9
	Brome	19.8	8.8	71.8
	Champlain	25.1	6.0	56.0
	Chateaugay	21.6	7.4	29.1
	Chicoutimi	37.5	11.0	104.3
	Compton	22.1	7.6	79.7
	Drummond	33.4	8.2	60.9
	Gaspe East	35.7	12.2	98.5
	Gaspe North	49.9	12.9	60.8
	Joliette	26.0	13.4	66.2
	Kamouraska	27.8	8.7	66.6
	Labelle	38.1	10.2	79.2
	Laviolette	26.4	9.2	69.3
	Levis	19.4	9.4	66.6
	Lotbiniere	29.5	9.1	83.3
	Magdalen Is.	28.0	7.4	84.7
	Matane	33.9	9.2	76.5
		33.4	*8.9*	*76.5*
	Matapedia	39.7	9.4	85.5
	Megantic	29.6	12.4	56.7
		29.0	*10.5*	*56.7*
	Maskinonge	23.5	8.2	70.5
	Nicolet	26.5	10.5	70.9
	Papineau	24.8	15.0	34.3
	Rimouski	32.2	9.4	77.1
	Riviere du Loup	31.1	10.4	78.8
	Roberval	38.8	10.2	87.6
	St. Hyacinthe	24.0	15.0	66.0
		23.2	*11.8*	*64.4*
	St. Jean	20.6	10.8	57.2
	St. Maurice	30.8	9.6	80.4
	Shefford	24.8	9.5	72.6
	Temiskaming	41.7	11.4	104.0
		41.3	*10.0*	*100.2*
	Terrebonne	25.2	8.3	59.2
		25.2	*8.1*	*59.2*
	*Wolfe	30.7	9.0	72.8
New Brunswick	Albert and Westmoreland	35.3	10.4	41.9
	Carleton-Victoria	24.9	10.5	76.4
	Fredericton-Sunbury-York	24.5	9.7	63.4
	Gloucester	37.0	12.1	106.8
	Kent	32.7	11.1	72.7
	Kings-Queens	16.4	9.8	48.3
	Madawaska	31.7	9.6	91.5
	Northumberland	25.6	12.9	113.8
	Restigouche	29.8	10.2	97.2
	St. John-Charlotte	21.8	13.0	49.1
Nova Scotia	*Cape Breton Is.	24.4	10.4	88.1
	Halifax	29.2	14.8	62.9
Prince Edward Island	Province	21.0	10.9	57.7

*Figures from Annual Report.
Figures in italics are resident rates.

TABLE X

MILK CONTROL IN FULL-TIME LOCAL HEALTH SERVICES

	No. of Full-Time Health Departments		No. with Compulsory Pasteurization		No. Carrying Out Inspection of Dairy Farms		No. Carrying Out Inspection of Dairy Plants		No. of Pasteurization Plants		No. of Raw-milk Plants Supplying Area	
Province	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
B.C.	2	4	0	0	2	4	2	3	27	9	304	9
Alta.	2	2	0	0	2	2	2	2	11	4	5	47
Sask.	2	0		0	2	–	2	–	11	–	5	–
Man.	3	1	0	0	2	1	2	1	14	7	74	18
Ont.	13	1	13	1	12	–	13	–	195	–	0	–
Que.	5	3 7	0	0	5	30	5	32	65	48	270	1,289
N.B.	0	10	–	0	–	8	–	9	–	26	–	168
N.S.	1	1	0	–	1	–	1	–	16	–	3	–
P.E.I.	0	1	–	0	–	1	–	1	–	4	–	16
Total	28	57	14	1	26	46	27	48	339	98	711	1,547

EXPENDITURES

For the purpose of providing information as to the expenditures for public health purposes in communities having a full-time medical officer of health, the questionnaire requested information regarding the amount provided in the department of health budget, the amount expended by other departments of the municipality for public health work—such for instance as school medical inspection, the amount provided by grants from the Provincial Government or received from voluntary agencies in the support of local public health work. Included in the expenditures for communicable disease control were isolation hospital costs, ambulance service, immunization programs, quarantine costs, fumigation, etc. Similarly, in tuberculosis control the expenditure for sanatorium care, cost of clinics, social service, surveys, etc., was requested. Since large expenditures are made by municipal governments for

TABLE XI

PASTEURIZATION OF MILK IN FULL-TIME LOCAL HEALTH SERVICES

Extent of Pasteurization	Urban	Rural
Total No. of Full-Time Health Departments..	28	57
No. with complete compulsory pasteurization.	14	0
No. with 75% or more	23	4
No. with 50% or more	29	6
No. with no pasteurization	0	20

TABLE XII

EXPENDITURES (1938)

Province	Full-Time Health Services	Health Budget $	Paid by other municipal departments $	Provincial grants $	Grants paid by voluntary agencies $	Medical Relief and Hospitals $	Total Expenditures $
British Columbia	Gr. Vancouver Met. area	(1) 111,308	192,037	34,103	14,903	590,100	942,451
	Victoria	(1) 34,895	15,541	.....	.....	68,048	118,484
	Saanich	(1) 7,279	2,500	3,000	.....	No data	12,779
	Kelowna	(1) 7,799	5,360	2,041	917	No data	16,117
	Fraser Valley	.....	.....	(1) 12,570	.....	No data	12,570
	Peace River	.....	670	(1) 11,138	1,913	No data	13,721
Alberta	Calgary	(1) 56,322	30,098	.....	.....	No data	86,420
	Edmonton	(1) 26,151	.....	.....	.....	121,644	147,795
	Foothills	(1) 3,963	.....	5,000	.....	No data	8,963
	Red Deer	(1) 4,402	.....	5,000	.....	No data	9,402
Saskatchewan	Regina	(1)(2) 75,293	.....	.....	.....	111,951	187,244
	Saskatoon	(1) 23,766	.....	.....	.....	No data	23,766
Manitoba	Winnipeg	(2) 104,102	40,165	.....	.....	No data	144,267
	Brandon	(1) 11,500	(2) 6,009	.....	.....	No data	17,509
	St. Boniface	(1) 4,915	.....	4,916	.....	No data	9,831
	St. James-St. Vital	.....	7,000	7,000	.....	No data	14,000
Ontario	Toronto	885,205	179,690	.....	.....	(2) 1,140,704	2,205,599
	Hamilton	(1) 155,182	(2) 44,254	500	.....	No data	199,936
	Ottawa	122,983	(2) 151,761	93,908	.....	812,317	1,180,969
	Windsor	68,284	(2) 74,566	4,250	.....	130,463	277,563
	London	(1) 29,207	(2) 33,341	1,000	.....	No data	63,548
	Brantford	21,620	3,180	500	1,500	67,892	94,692
	Fort William	13,449	.....	.....	.....	No data	13,449
	Kingston	3,137	12,895	.....	550	37,400	53,982
	Peterborough	17,760	(2) 12,465	2,500	1,211	6,926	40,862
	Kirkland Lake	(1) 9,804	(2) 10,647	440	1,623	12,907	35,421
	Kitchener	27,065	.....	1,000	.....	No data	28,065
	East York	(1) 18,781	2,500	1,196	.....	No data	22,477
	York Township	(1)(2) 49,295	.....	.....	.....	75,753	125,048
	Eastern Health Unit	.....	.....	20,193	6,405	.....	26,598

TABLE XII—*Cont.*

Province	Full-Time Health Services	Health Budget $	Paid by other municipal departments $	Provincial grants $	Grants paid by voluntary agencies $	Medical Relief and Hospitals $	Total Expenditures $
New Brunswick (1)	Albert and Westmoreland	8,021	(2)(3) 44,936	.....	.....	26,099	79,056
	Carleton-Victoria	2,207	(2) 9,727	4,753	.....	25,560	42,247
	Fred.-Sunbury-York	6,860	(2) 32,161	.....	.....	36,931	75,952
	Gloucester	1,356	(2) 20,265	.....	.....	7,492	29,113
	Kent	961	.....	6,011	.....	No data	6,972
	Kings and Queens	1,825	.....	3,300	.....	17,521	22,646
	Madawaska	1,865	.....	7,576	.....	No data	9,441
	Northumberland	3,050	(2) 23,722	3,900	630	5,100	36,402
	Restigouche	1,690	(2) 9,750	4,800	300	2,000	18,540
	St. John–Charlotte	28,847	3,800	17,520	3,300	No data	53,467
Nova Scotia	Halifax	(2) 63,557	2,500	19,900	8,300	184,640	278,897
	Cape Breton Is.	.....	.....	32,000	.....	No data	32,000
Pr. Edward Is. (1)	Province	25,522	1,200	37,250	3,723	120,250 (3)	187,945
Quebec	Hull	8,400	.....	2,100	1,400	88,000	99,900
	Lachine	(1)(2) 19,759	15,410	.....	500	No data	35,669
	Montreal	1,027,784	390,730	.....	.....	2,488,869 (2)(3)	3,907,383
	Quebec	117,304	18,400	.....	.....	No data	135,704
	Three Rivers	22,846	.....	.....	.....	No data	22,846
	County Health Units	430,693	.....	.....	.....	.....	.....
GRAND TOTAL		3,666,014	1,397,280	349,365	47,175	6,178,567	11,638,401

(1) Isolation hospital not included.
(2) Includes cost of patients in sanatoria.
(3) Includes care of mentally ill.

TABLE XII—*Cont.*

Health Unit	Provided in Health Budget	Health Unit	Provided in Health Budget	Health Unit	Provided in Health Budget
Abitibi	$14,307	Gaspé—North	5,480	Papineau	11,797
Argenteuil	9,862	Joliette	12,000	Rimouski	15,000
Arthabaska	10,746	Kamouraska-L'Islet	11,280	Rivière-du-Loup—Témiscouata	15,707
L'Assomption-Montcalm	12,000	Labelle	12,828	Roberval-Lac St. Jean	18,738
Beauce	11,523	Laviolette	11,979	St. Hyacinthe-Rouville	11,226
Bonaventure	12,980	Lévis	11,755	St. Jean-Iberville-Laprairie-Napierville	14,353
Brome-Missisquoi	8,634	Lotbiniere	12,560	St. Maurice	12,780
Champlain	10,434	Magdalen Is.	5,100	Shefford	9,586
Chateauguay-Huntingdon	9,641	Maskinonge	7,030	Temiskamingue	13,161
Chicoutimi	18,196	Matane	11,382	Terrebonne	14,228
Compton	10,493	Matapédia	12,928	Wolfe	8,340
Drummond	10,740	Megantic	15,164		
Gaspé—East	8,205	Nicolet	8,530		

the medical care of indigents, medical relief and grants to general and other hospitals, information concerning these was particularly requested. In addition, information concerning grants made by the municipal government to voluntary agencies for medical, dental and nursing care, such as the Victorian Order of Nurses and the Canadian Red Cross Society, was also sought. The total expenditures, therefore, of the municipality for public health include the expenditures in the department of health budget, the expenditures of other departments of the municipal government, and money paid by the municipal government for hospitalization costs, medical relief, etc., and grants made to voluntary agencies for medical, dental and nursing care.

Wide differences are found in the distribution of public health expenditures in the departments of municipal government. Isolation hospital costs may be paid by the department of health or by the municipal hospital board or included in the general hospital costs. It is not possible for the medical officer of health to supply the information relating to the complete public health activities of his municipality. It was found difficult to obtain data concerning school medical inspection costs where these services are not conducted by the department of health. Similarly, hospitalization charges and the cost of medical relief and indigent medical care were obtained from only part of the departments. It is felt, however, that a start has been made by this survey and that the publication of the report will permit medical officers of health to understand more fully the purposes of the study, and, in consequence, municipal governments will be able to co-operate more fully in subsequent surveys. In table XII the data are provided for the 85 communities under the appropriate headings as used in the questionnaire. The communities are arranged by provinces. Expenditures have not been expressed per caput because of the incompleteness of the data and because comparisons cannot properly be made between municipalities even of similar populations because of wide differences in population constitutions and economic and other factors. The attempt of the Committee to obtain comparable information has met with a considerable degree of success and it is hoped that subsequent surveys will permit of the grouping of municipalities and the publication of expenditures in such a way that the data can be correctly interpreted and used. This will be possible if the local departments appreciate the purpose of the study and seek to present the expenditures according to a clearly understood schedule.

The total expenditures of the 85 communities as provided in the respective department of health budgets amount to $3,666,014. Including hospital and other costs, the total expenditure amounts to $11,638,401. As these communities serve 50 per cent of the population, it is possible to obtain an idea of the extent of the entire expenditures for local health services in Canada.

It should be remembered that the survey relates to 1938 and that the data presented in the tables must not be interpreted as presenting the present status (1942) of full-time local health services.

CURRENT HEALTH LITERATURE

The House Fly as a Vector of Food Poisoning Organisms in Food Producing Establishments

FLIES have been repeatedly suspected and often confirmed as the vector of food poisoning bacteria. It has been shown that flies may contain enormous counts of bacteria and that these may be deposited on food in large numbers by defaecation and regurgitation. The experiments recorded in this interesting paper shed further light on this subject. In brief, it was shown that flies fed on food infected with *Salmonella enteritidis* could transmit the organism to normal fly populations with ease and that this could be repeated in series. All surfaces with which infected flies came in contact became potential sources of infection for other insects. Organisms were present on the outside of the fly and also in the digestive tract, where they were found to survive for the life span of the insect. Infected flies transferred the organism to mice and in turn normal flies became infected from these mice. Fly eggs allowed to develop in mash infected with *Salmonella enteritidis* gave rise to infected maggots, pupae and adults.

The significance of these findings in regard to food plant sanitation, especially where one is concerned with products to be consumed without cooking, is obvious. The authors regard flies as much more important vectors of food poisoning organisms than rats and mice.

Morris Ostrolenk and Henry Welch, Am. J. Pub. Health, 1942, *32*: 487.

The Nasopharyngeal Swab in the Diagnosis of Pertussis

THIS article records results of the use of the nasopharyngeal swab and the cough plate in the diagnosis of pertussis and points out the advantages and disadvantages of the two methods. In many cases examined duplicate tests were made. In one series of 152 cases on whom 210 comparative tests were made there were 50 tests in which the swab was positive and the plate negative as compared with 19 tests in which the swab was negative and the plate positive. It was therefore apparent that the swab method was superior to the cough plate and the use of both procedures superior to either alone.

In 154 cases studied 64 per cent were positive by swab at some time during their course whereas 49 per cent were positive by plate. These values were low but some of the cases were not seen until late in the disease. Also the specimens were secured by a varied personnel some of whom were inexperienced. It was felt that these results indicated what might be expected in a public health unit.

The survival of *H. pertussis* on the nasopharyngeal applicator was tested at a temperature of 2°C. and proved unsatisfactory. Isolation of the organism was facilitated by prompt inoculation on media and incubation. This fact together with the delicacy required in the use of the nasopharyngeal swab leaves something to be desired in the laboratory diagnosis of pertussis. The method, however, does give promise for the investigation of convalescents and contacts in regard to the carrier state and such studies are in progress.

T. M. Saito, John J. Miller and Charles W. Leach, Am. J. Pub. Health, 1942, *32*: 471.

Opsonocytophagic Reaction to Whooping Cough Vaccination

SINCE approximately sixty per cent of the deaths from whooping cough occur in infants under one year of age it becomes of the greatest importance that vaccination be directed to the very young infant if efficacious in this group. The authors accordingly undertook to investigate the serological responses of children of various ages to pertussis vaccine prepared by the method of Sauer. The antibody response was determined by means of

the opsonocytophagic test. In one group of 337 children 91.6 per cent showed an increase in phagocytic activity six weeks after the first dose and in the majority of these the increase was very appreciable. However in infants under three months the response six weeks after the first injection was not as great as in the older ages. In infants over three months of age the rapidity of response was proportional to age but the maximum reached was approximately the same. The effect of the interval between doses was also analysed and appeared to be of little significance.

The effect of a single stimulating (recall) dose of vaccine from six months to five years after the primary course of injections was explored and a rise of apsonins was observed to doses of a quarter, a half or one cubic centimetre. Accordingly the administration of an annual stimulating dose to young vaccinated children is recommended.

Alvin E. Keller, J. Cyril Paterson and Paul M. Densen, Am. J. Pub. Health, 1942, *32*: 240.

Miniature Mass Radiography in the R.A.F.

THIS article presents the results of miniature radiography of 20,000 Royal Air Force personnel. Each individual whose miniature film was found abnormal was subjected to clinical and pathological investigation in special units set up for the purpose. Active cases of tuberculosis detected in this survey numbered 54 (0.27 per cent) and inactive cases 67 (0.33 per cent). Of the 54 active cases 25 had moderately advanced or advanced disease. Calcified nodules, calcified glands, or both were revealed in a further 168 persons so that the total evidence of tuberculosis infection amounted to 289 or 1.45 per cent.

Lung abnormalities apart from tuberculosis were encountered in 100 cases and consisted mostly of thickened pleura and unresolved pneumonia.

A careful description of the two types of equipment used is given and the constitution of the clinical unit is outlined whereby approximately 100 examinations were made per hour.

R. R. Trail, Lancet, May 23, 1942, p. 6195.

Whither Industrial Medicine? Observations on Certain Economic and Social Factors

INDUSTRIAL health is the concern of medical men interested in industrial medicine but it is also the concern of management and labor. To a great extent the welfare of American workers is an indication of the nation's progress.

Figures from the official report of the United States Bureau of Labor for 1939 with reference to injuries, disabilities and deaths in industry together with other available evidence give an accurate picture of the state of health affairs in and out of industry in the nation. The malnutrition, the low standard of living, the sickness and disability which exist do not stand for sound national health. They stand for chronic illness, incapacity of productive labor and inefficiency in industry and in national economy.

In this article the author discusses the necessity for an American National Defense and Health Program and its relation to the physician in industry. Medicine and industry share a responsibility for the ill-health which affects the efficiency of workers. Many industrialists still regard the physical well-being of their workers as of secondary importance. This applies particularly to small plants and sweat shops.

Medical science has undergone many changes. In the highly industrialized and specialized society of today, medicine calls not only for new forms of knowledge and education but also for new forms of medical practice and service. There must be full health protection without exception for all people. This necessitates a more ardent interest in promotion of the health and safety of industrial workers as well as society as a whole.

In conclusion the author gives the following basis for the success of an American National Defense and Health Program as it relates to the physician in industry:

1. A proper and correct orientation and understanding of industrial medicine by the medical profession, particularly as it pertains to the socio-economic, politico-economic, and medicolegal phases.
2. Education, training, experience and practice in the field of industrial medicine and traumatic surgery.
3. A comprehensive armamentarium.
4. A study and knowledge of the philosophy and psychology of the industrially injured.
5. A comprehensive study and understanding of compensation and other labor laws, and a profound orientation in, and sympathetic understanding of, the history of the labor movement in general and as it relates to industrial medicine.
6. Unity of purpose and unity of action of all the American people, including the physician in industry.

A. S. Leven, Ind. Med., February, 1942, p. 58.

BOOKS AND REPORTS

The Doctors Mayo. *By Helen B. Clapesattle. Introduction by Guy Stanton Ford. Toronto: William Collins Sons & Co. Canada Ltd., 1941. 822 pages. $4.50.*

THE DOCTORS MAYO is a remarkable story of the progress of medicine from the horse and buggy days to the present time, covering perhaps the greatest century of medical progress. Dr. W. W. Mayo, "the old doctor", was a real pioneer in surgery; after settling in Rochester, Minn., he built up an extensive practice which eventually developed into one of the greatest clinics. His sons Dr. Will and Dr. Charlie, brought up in an atmosphere of medical work, inherited an interest in surgery which eventually made them famous throughout the scientific world. THE DOCTORS MAYO is intensively interesting from cover to cover. Those who may never have visited the famous Mayo Clinic will learn a great deal about this institution. The Mayo Foundation, now a part of the University of Minnesota, has through the foresight of the Doctors Mayo become unique as a centre for training specialists in medicine, in surgery and in education.

D. V. Currey

Poliomyelitis and Encephalitis, Manitoba, 1941

The story of the twin epidemics of encephalitis and poliomyelitis which occurred in the Province of Manitoba last year:

PART I

The Epidemiology of Poliomyelitis and Encephalitis.

PART II

The Diagnosis, Pathology, and Treatment of Poliomyelitis.

PART III

The Diagnosis, Pathology, and Treatment of Encephalitis.

Reprinted from the June 1941 issue of the
CANADIAN PUBLIC HEALTH JOURNAL

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CANADIAN PUBLIC HEALTH ASSOCIATION
111 AVENUE ROAD, TORONTO, ONTARIO

First Aid to wartime food budgets

SOME HINTS TO HELP YOU KEEP FOOD COSTS DOWN

1. PLAN AHEAD! It is best to make up menus for several days ahead, remembering that *what* you eat is as important as *how much* you eat. The essential foods for a balanced diet should be included first, then whatever extras your budget allows Latest market news is often carried in newspapers and radio broadcasts. It helps you plan meals around the foods in good supply at moderate prices. Leftovers should be included too. When you bake, fuel may be conserved by cooking a second baked dish at the same time—for example, a dessert or some food for the next meal. Buy what you need and can use, but do not hoard. There is plenty of food.

2. BUY WISELY! The most expensive foods are not always the most nutritious. Less expensive cuts of meat and smaller sizes of fruits are as high in food value, and frequently as good-tasting, as fancier ones. Foods in season are usually cheaper. Larger sizes of canned and packaged foods are generally more economical. Information on labels enables you to compare values. Evaporated milk and most kinds of cheese supply the same food elements as fresh milk, and sometimes enjoy a price advantage. Canned fruits and vegetables may be used instead of fresh. Beef, lamb and pork livers are as nutritious as calves' liver. Cereals should be whole grain, and bread Canada Approved, brown or white.

3. COOK WITH IMAGINATION! Higher wartime food prices are a challenge to our ability as cooks. *Good* cooking can make masterpieces out of the humblest foods; *poor* cooking can ruin even the best foods. Many ordinary dishes can be made most attractive with just the right seasonings, sauces *and imagination!* Cook books and magazines suggest new and interesting ways of preparing foods. Don't waste anything! Trimmings and bones from meat and fowl, and outside leaves of vegetables, may be added to soups. The water from vegetables is good for soups and stews. The tendency is to *overcook* most foods. This wastes fuel and harms food values.

OTHER HINTS: Home canning can save money, when vegetables and fruits are available in good quantity at low prices. A home garden is excellent—if you have the space, the good soil, the time and knowledge necessary for success. *Every* farm family should have a home garden. Wild berries and wild greens sometimes are available—your department of agriculture may issue a pamphlet on wild greens.

Metropolitan will send you the free booklets, "Metropolitan Cook Book" and "Food for Health in Peace and War," containing directions for budgeting your food money to best advantage. Address Booklet Dept. 8-J-42, Canadian Head Office, Ottawa.

An interesting 10-minute Technicolor movie on food and health—"PROOF OF THE PUDDING"*—is being shown throughout Canada. Be sure to see it when it comes to your theatre.*

This advertisement is published in the interest of the Nutrition Program of the Federal Department of Pensions and National Health.

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